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INDIA, WORLD AND EMPIRE

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INDIA
WORLD AND
EMPIRE

BY
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PREFACE

THE purpose of this book is to provide a course of Geography suitable for candidates for the Indian School Leaving Certificate and Matriculation Examinations.

Throughout the book attention is paid to the influence of geographical factors upon human life and activities; and the author has endeavoured to present the matter in an interesting style.

The book is divided into three sections. The first deals with the physical and mathematical portions of the subject, and with general world geography. The second section consists of a survey of the continents. Each continent is considered, first generally and then in detail, special reference being made to parts of the British Empire; there is in addition an "empire summary" at the end of the book, which gives particulars of smaller colonies and protectorates. The third section is a detailed study of India.

It is expected that readers will use an atlas of good physical maps, such as the *Indian School Atlas*. This book has therefore few maps of countries, but it contains a large number of sketch maps. These illustrate special features, and they should be valuable as a guide to the student when making sketch maps for himself.

The index should serve an educational purpose; it is designed to facilitate reference to the chief geographical terms, the more important of the world's cities, and the principal human activities in the various continents.

The writer expresses his appreciation of the valuable assistance rendered by the staff of the Oxford University Press and its advisers, who made many useful suggestions whilst the book was in course of preparation.

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SECTION I

THE PRINCIPLES OF GEOGRAPHY

I. LATITUDE, LONGITUDE AND PROJECTIONS

The first airship to cross the Atlantic Ocean was a British vessel, known as R. 34. This vessel made its historic voyage in 1919. During the voyage a wireless message was received in Britain, America and other lands, stating that R. 34 had reached the position 52° 50′ N., 34° 30′ W.

What did the message tell? It told the **latitude** and **longitude** of the airship, that is the distance north of the equator and the distance west of Greenwich (London). It enabled people to pick out on a map of the Atlantic the very place above which R. 34 was cruising when the message was despatched. Let us see how latitude and longitude are measured, assuming for the present that the earth is a globe.

First, imagine yourself standing on some tiny equatorial island on March 21. Looking out at daybreak, you see the water stretching away in every direction until it appears to meet the sky. The circular line where sea and sky appear to meet marks your **horizon**.

On the eastern horizon you see the sun rising. He mounts higher and higher, until at midday he is in your **zenith**, and his rays fall vertically upon your head. Lines drawn from your position to the two positions of the sun, form a right angle (90°). The sun has travelled along the arc AD (Fig. 1) and his **altitude** has increased from 0° to 90°. The curve AD is often spoken of as 90°; it is really the arc subtending 90° at the centre of the earth. The whole circumference subtends an angle of 360° at the centre O (Fig. 2).

Divide the angle AOD into three equal parts as in the figure. When the sun is at B his altitude is 30°; at C it is 60°.

Next let us suppose a solid globe is cut into two equal portions. In figure 3, *ENWS* is the flat face of one hemisphere, *N* and *S* being the two poles, and the line joining these points the axis. Draw the diameter *EW* perpendicular to *NS* and divide the right angles *EON* *EOS* into three equal parts. *A* is 30° north of *E*, and *B* is 60° north of *E*, whilst *F* and *G* are 30° and 60° respectively south of *E*.

Turn the hemisphere so that a portion of the curved surface becomes visible. *EP* shows the position of the equator—drawn round the globe midway between the poles. Lines drawn through *A*, *B*, *F*, *G* round the globe and parallel to the equator are parallels

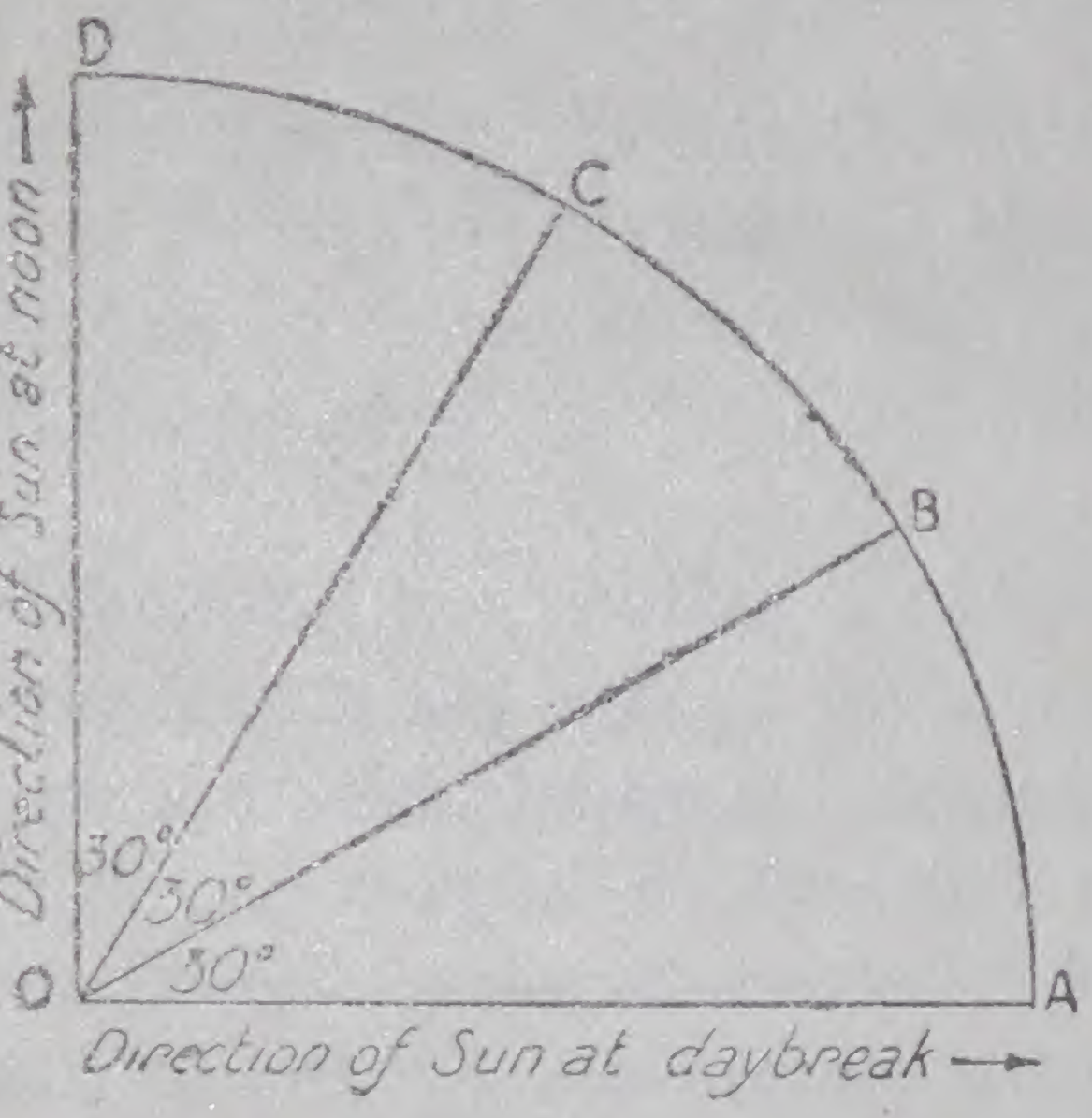

FIG. 1.

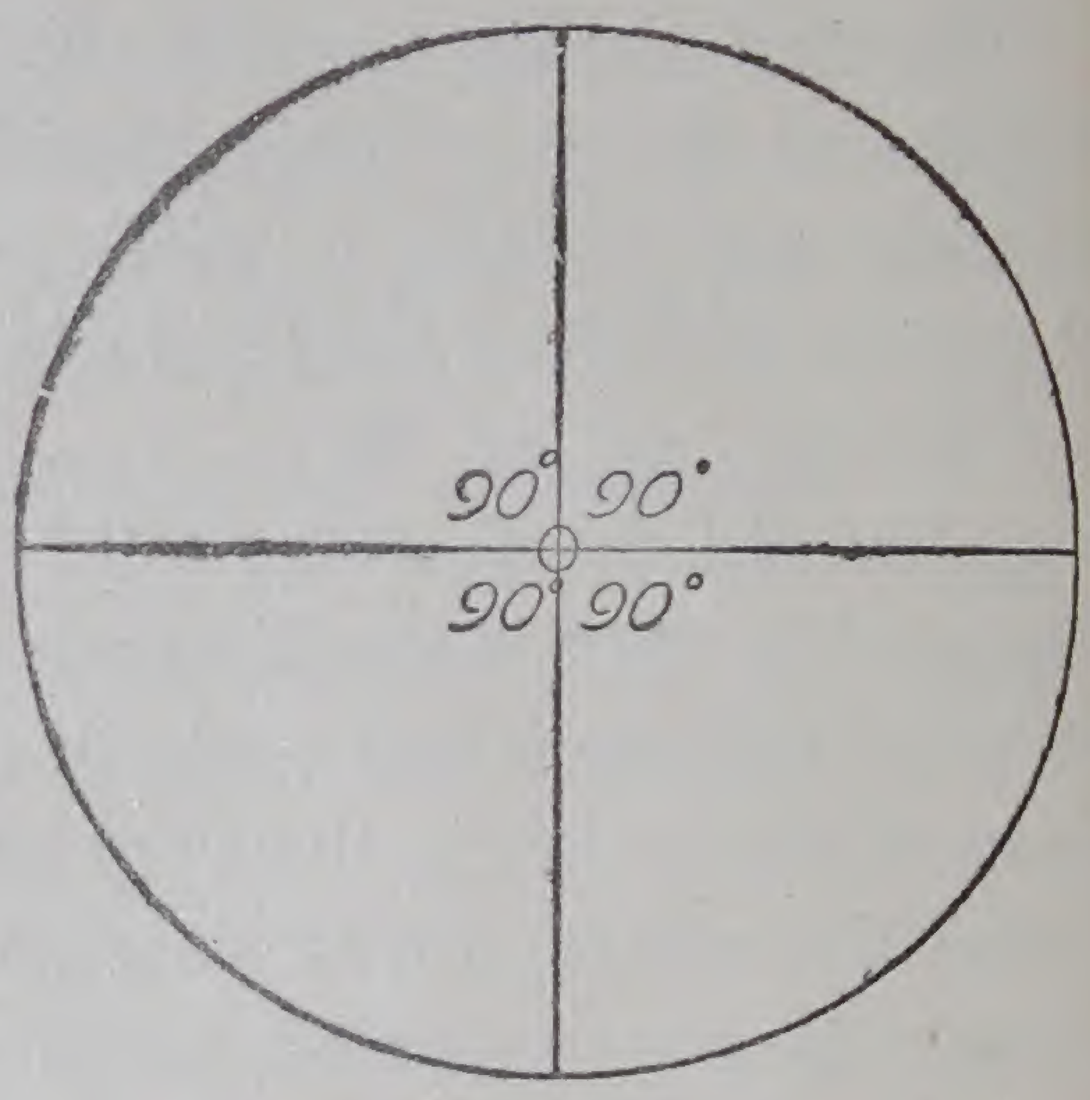

FIG. 2.

of latitude. On small scale maps parallels are drawn at intervals of 5, 10 or 20 degrees; on large scale maps they may be drawn at intervals of 1 minute—the $\frac{1}{60}$ of a degree.

The tropic of Cancer and the tropic of Capricorn are parallels of latitude, one $23\frac{1}{2}°$ N. and the other $23\frac{1}{2}°$ S. Two other important parallels are the Arctic Circle ($66\frac{1}{2}°$ N.) and the Antarctic Circle ($66\frac{1}{2}°$ S.).

There are, of course, 90 degrees of latitude between the equator and each pole. Each degree contains 60 minutes, and each minute contains 60 seconds. Hence Calcutta, which is situated midway between parallels 22° N. and 23° N., is in latitude 22 degrees 30 minutes north, or briefly 22° 30′ N.; Calicut is $11\frac{1}{4}°$ N. or 11° 15′ N.

The distance from the equator to the pole is roughly 6250 miles. It is therefore quite easy to find the equivalent in miles of 1 degree of latitude; it is $\frac{6250}{90} = 69{\cdot}5$ miles (about).

Now just as latitude is a measure of distance from the equator, **longitude** is a measure of distance from some selected meridian. The meridian of Greenwich (London) is generally used as reference

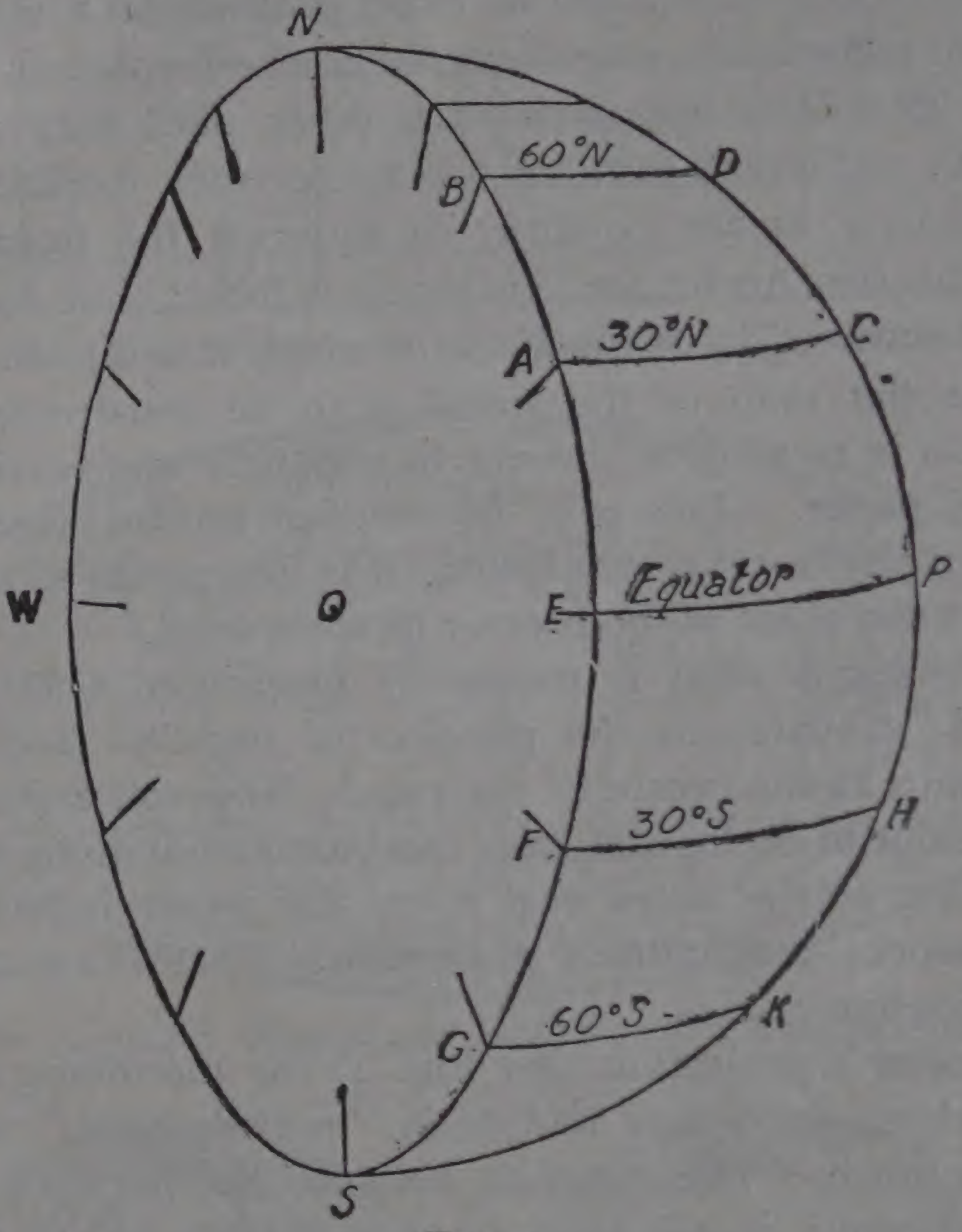

FIG. 3.

All places on *AC* are 30° N.; those on *FH* are 30° S.

meridian. Examining a globe, you will notice a line drawn through Greenwich, and round the globe through both poles. That line is the **meridian of Greenwich.** On each side of it are other meridians, all passing through the poles, and numbered off eastwards and westwards from 0 to 180. Thus a place in longitude 180° E. (or 180° W.) is halfway round the world from Greenwich.

Parallels of latitude and meridians of longitude drawn upon a globe form a network. A message giving the latitude and longitude

of a ship at sea enables one to pick out the particular mesh in which the ship is sailing.

If you are told the latitude of Calcutta you merely know that the city is somewhere on the parallel 22° 30′ N.; if, in addition, you are told that the longitude is 88° 30′ E., you know exactly where Calcutta is situated. Therefore, given the latitude and longitude of a place, you can find its exact position on a map.

Any two consecutive meridians are farthest apart at the equator, and they gradually approach each other until they meet at the pole. The arc intercepted by two consecutive meridians is about $69\frac{1}{2}$ miles long at the equator, 64 miles at the tropic, but only 28 miles at the Arctic (or Antarctic) Circle; but each of these arcs is, of course, $\frac{1}{360}$ of the circle of which it is a part.

When a flat map of the world is to be constructed, the first thing to do is to project the net of parallels and meridians on to a sheet of paper. This may be done in several ways, but none gives a perfectly satisfactory result; it is impossible to map a round world on a flat sheet without error of some kind.

To understand what is meant by projection, take a spherical cage made of wires in the position of parallels and meridians. Place a lamp at the centre of the cage. Now roll a sheet of paper into a cylinder to enclose the cage, and to touch it along the equator. The shadow of the wires cast upon the paper is the projection of the network—**a cylindrical projection.** The Mercator projection is a modification of this.

In **Mercator's projection** (see Fig. 4) the meridians are parallel to each other—as if they had been "pulled apart" towards the north and south. The intervals between the parallels of latitude are not uniform; it will be noticed that from 60° to 80° is more than three times as far as from 0° to 20°. This is because the degrees of latitude are calculated to increase in proportion to the increase in the degrees of longitude. Consequently, areas in high latitudes are greater than they ought to be; the higher the latitude the greater the error.

Mercator's map is good for *direction*. It is therefore used in making maps for seamen. The purpose of Mercator may be stated in his own words. He said to the seamen studying his map, "If you wish to sail from one port to another, here is a chart and a straight line on it. If you follow the line you will certainly arrive

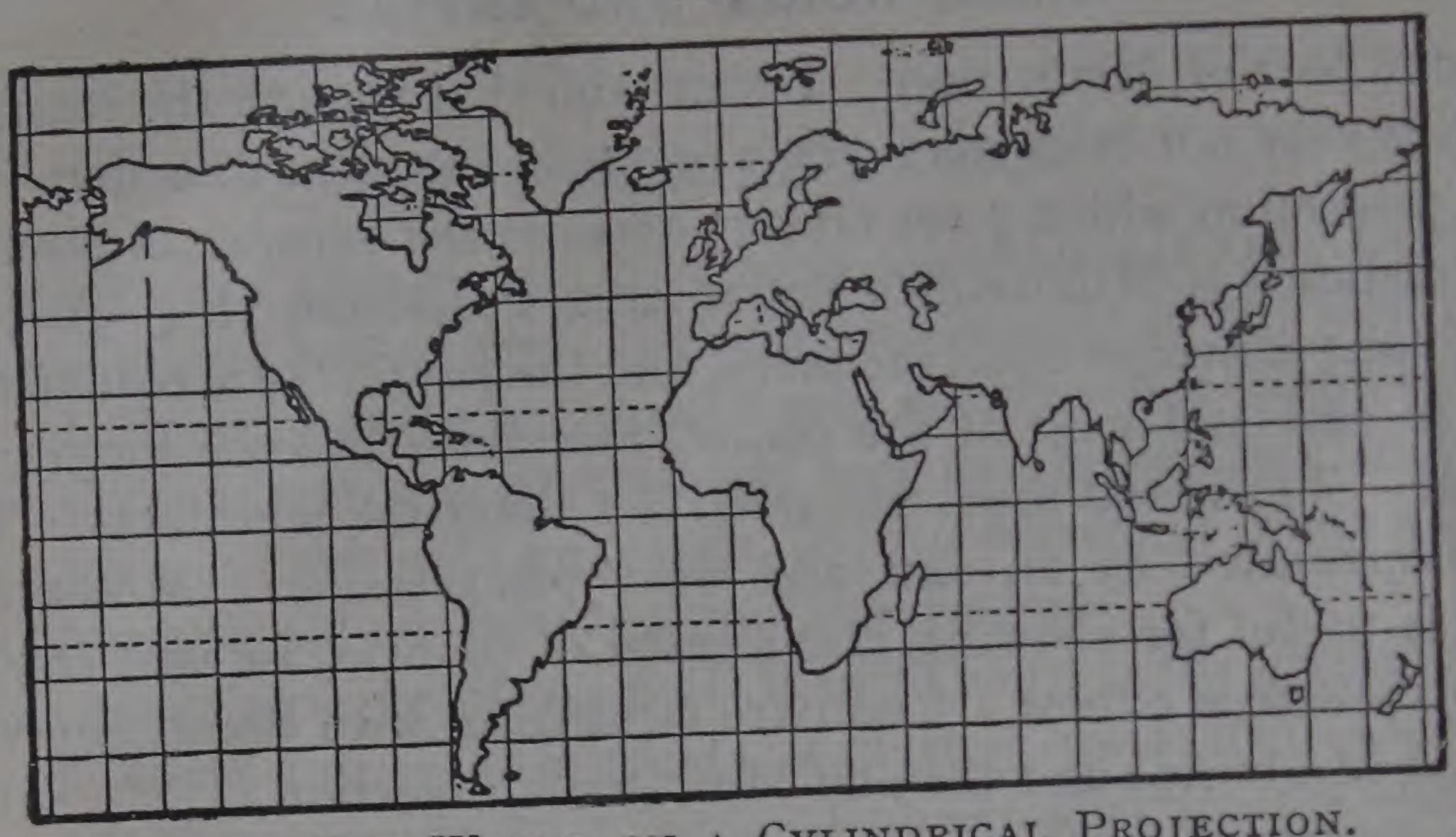

FIG. 4.—THE WORLD ON A CYLINDRICAL PROJECTION.

FIG. 5.—THE WORLD ON MOLLWEIDE'S PROJECTION.

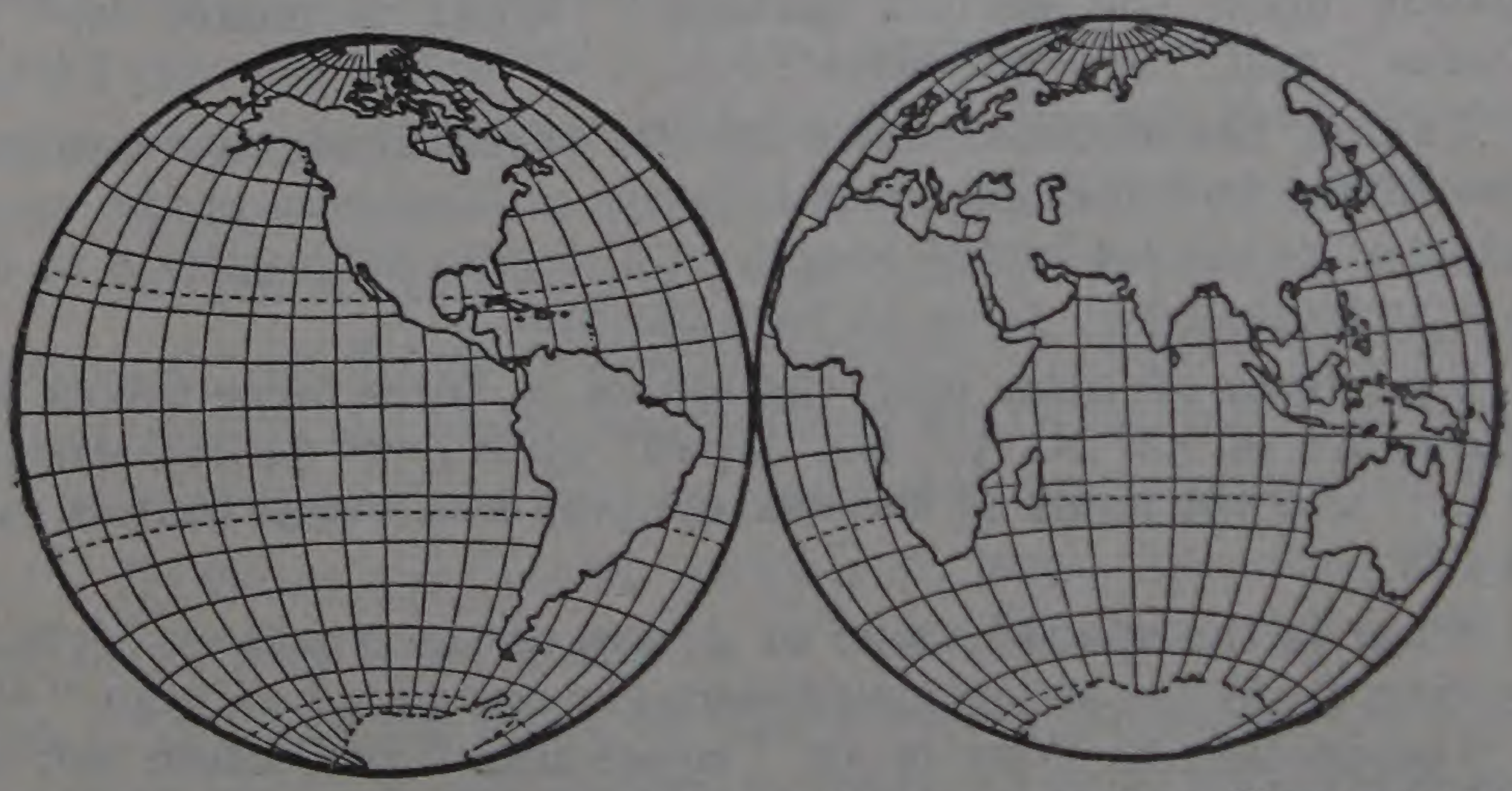

FIG. 6.—LAMBERT'S EQUAL-AREA HEMISPHERICAL PROJECTION.
Margins are distorted as on Mollweide's Projection.

at your port of destination. I warn you that though the length of the line may not be correct, yet it points in the right direction."

A projection which gives correct areas at the expense of direction and distance is Mollweide's **Equal Area Projection** (Fig. 5). The meridians converge upon the poles, and the parallels are equidistant. But to east and west of the centre, meridians become longer and longer. Thus land areas are *stretched* along the meridians. This is compensated by an east and west compression. Mollweide's map is useful for showing distribution of tundras, forests, etc.—to show their true extent. Compare Greenland with South America, first on Mollweide and then on Mercator's projection.

To represent northern lands with a fair degree of accuracy, a Conical Projection is used. Take the wire cage and lamp again. Fold a piece of paper into a cone, and place it like a cap on top of the cage. The most accurate part of a map made on this projection is, of course, that nearest to the parallel the cone actually touches; but adjacent areas are nearly correct.

Modified conical projections are often used. In these the method of "compensation" is followed. Strict accuracy in one part of the map is sacrificed in order to reduce the error in another part. This is called a **Compensatory Projection.**

EXERCISES

1. What is the greatest possible latitude, and what the greatest longitude upon the earth's surface? What is meant by "high latitudes" and "low latitudes"?

2. Taking the circumference of the earth along the equator as 25,000 miles, find the length of a degree of longitude at the equator. What change occurs in the length of a degree of longitude as either pole is approached? Give an explanation.

3. Find from an atlas map the names of three large towns whose positions are (*a*) 56° N., 37° E.; (*b*) 18° 55′ N., 72° 54′ E.; (*c*) 35° S., 135° E.; and the name of the nearest port to a vessel that is 15° N., 86° 15′ E.

4. What is the special value of a map of the world on Mercator's projection? What are its disadvantages compared with an "equal-area" projection? Why is an "equal-area" projection not satisfactory for all purposes?

II. THE EARTH AS A PLANET

Man appeared upon the earth perhaps 200,000 years ago. During that long period he has been acquiring knowledge of the world in which he lives. At first he learned very slowly. For many thousands of years man's chief business was to obtain food, and to protect himself from wild animals. He did not think much about anything which did not help him in these matters.

In course of time, people found that seeds sown in the ground and watered would bring forth plants, and they were then able to arrange for a regular supply of food. This explains why the ancient settled peoples lived beside large rivers.

Having made sure of a food supply, man had time to think about other things. He became interested in the earth upon which he lived, and in the heavens above the earth; that is, he began to study geography and astronomy. In these two branches the ancient Egyptians, Babylonians and Greeks made great progress. Both Chinese and Hindus were also interested in the same subjects.

They watched the heavens at night, and named many **constellations** or groups of stars. They saw constellations in the **zenith** (overhead), and others near the northern **horizon**. Then travelling northwards, they observed that the constellations which at first were overhead were sinking towards the southern horizon, whilst the others mounted higher and higher in the heavens. From this they concluded that the earth had a curved surface.

Later on were found other reasons for believing that the earth is round; some of them are given below: (*a*) Ships are continually going round the world—sailing away into the west and returning from the east. (*b*) When an observer ashore first sights an approaching vessel, he sees the masts and funnels, whilst the hull is hidden by the curved surface of the sea; a vessel so seen is said to be "hull down." (*c*) When a ship is far away from land, the sailor, standing on the deck, sees a wide stretch of water enclosed by a circular horizon; climbing the mast, he extends his horizon, but it is still a circle where sky and sea appear to meet. (*d*) If you stand in the sunlight a short distance from the wall of a house your shadow will be cast upon the wall. In just the same way, the earth's shadow

is sometimes cast upon the moon, and we say there is an eclipse of the moon. The edge of that earth-shadow is always round. A flat circular disc or a coin will cast a round shadow, but only when held in a certain position.

After all this it may seem strange to say that the earth is not perfectly round. Careful measurements have shown that there is some flattening around the north pole ; but for all practical purposes the earth may be regarded as a globe.

When they had discovered that the earth is a globe, it was not long before men found how to estimate its size. This was first done by

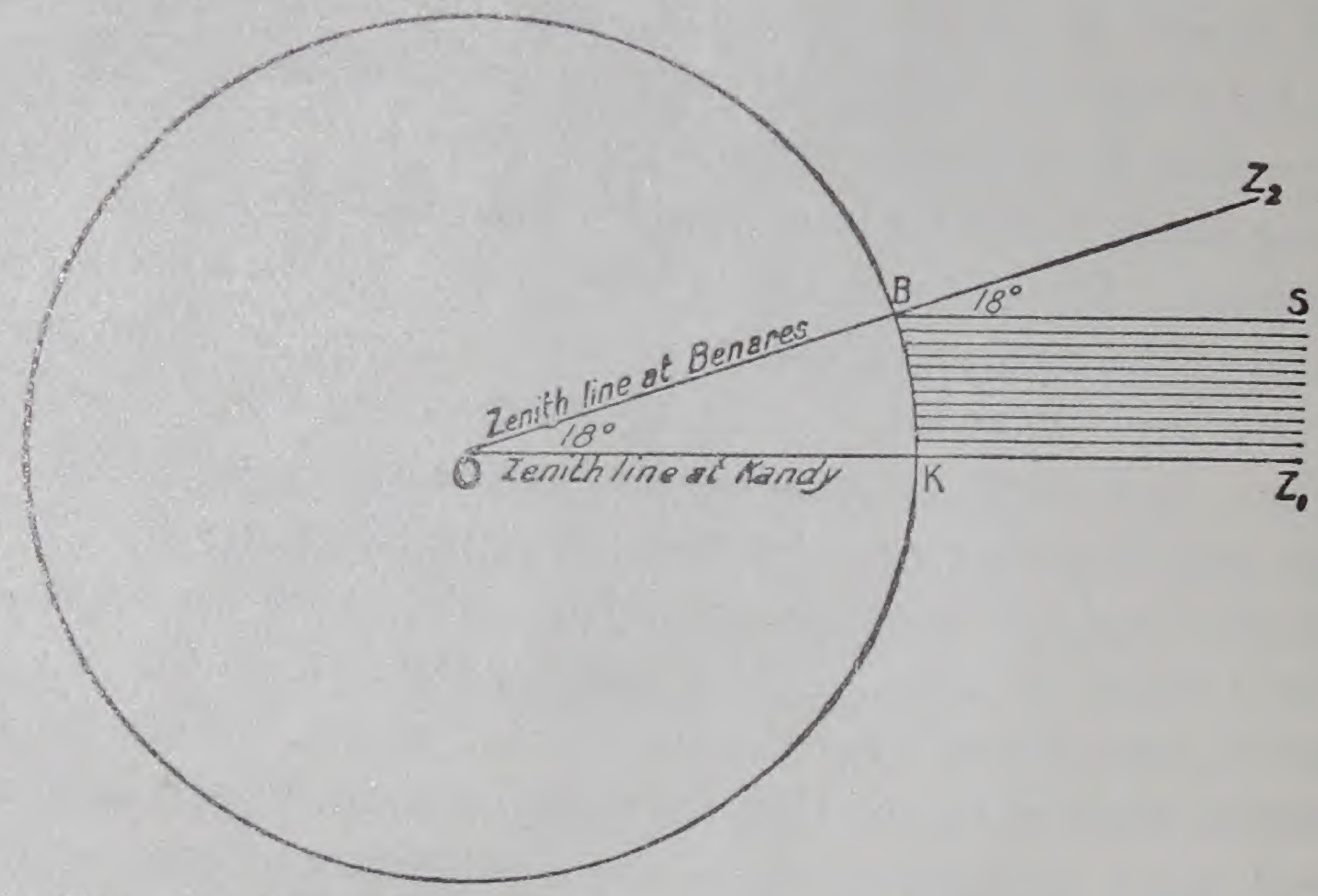

FIG. 7.—FINDING THE CIRCUMFERENCE OF THE EARTH.

a Greek (named Eratosthenes) in Egypt. Let us apply his method to India, using rough values only.

Consider two towns Kandy and Benares, one of which is about 1250 miles north of the other. When the sun is in the zenith at Kandy it will be found that his rays strike the ground at an angle of 72° in Benares—that is, they make an angle of 18° with the zenith-line.

Draw a circle with centre O. Take two points K and B on the circumference to show the positions of the towns. Now draw straight lines OKZ_1 and OBZ_2 ; these are the zenith lines. Draw the ray SB parallel to Z_1K to show the direction of the sun's rays in Benares. Then angle SBZ_2 = angle $KOB = 18°$. Now, the arc

KB is contained by the circumference just as many times as 18 is contained by 360 (the whole angle round *O*) ; and that is 20 times. Hence the circumference is $20 \times 1250 = 25{,}000$ miles. If we divide this number by π ($= 3{\cdot}1416$), we get over 7900. Hence we may say that the circumference of the earth is about 25,000 miles and the diameter is about 8000 miles.

The ancient scientists were wise men in their day, but there were many problems they did not solve. They observed the constellations pass along from east to west, and change their position as the year progressed. They watched the stars throughout the night, and saw them pale out as dawn approached. The sun rose in the east, mounted higher and higher until midday, and then sank into the west. They noticed also that the sun's midday altitude varied greatly in the course of a year. They found that certain " stars," which shone with a brilliant steady light seemed to *wander* amongst the rest ; these they called **planets** or " wanderers."

Having made their observations, the ancients set to work to map out the courses of the sun, stars and planets. They produced a complicated scheme that few could understand, and which has long been known to be incorrect. They blundered because they supposed the earth upon which they lived was the centre of the universe. They could not believe that their solid earth was moving. They believed that the heavenly bodies were moving round the earth.

The truth is that the earth *is* moving. The earth has two movements—it rotates upon its axis and it revolves in an orbit round the sun.

The earth rotates from west to east, so that the sun and stars appear to travel from east to west. The sun illumines half the world at one time ; the other half must be in darkness. When we see the stars fading out, we are just passing out of the shadow into the range of the sun's light ; halfway round the world there will be people just passing into the shadow.

The stars are suns. They look like points of light because they are so far, so very very far away from the earth. Our sun looks different from the stars because it is so much nearer.

The sun is 93,000,000 miles away from the earth. It is easy to say the number, but not so easy to understand what it means. An aeroplane, travelling at 150 miles per hour, could fly round the

earth in a week ; but it would require 70 years to fly to the sun, and many thousands of years to reach the nearest star.

The planets are not stars ; they are not self-luminous. They " shine " because they reflect the light of the sun, just as the moon does. Our earth must shine for the same reason ; it sheds " earth-shine " upon the moon. If there are any people upon the planet Mars, they will see the earth shining like a star in the heavens.

The earth is a planet, and like the other planets it travels in an orbit round the sun, taking $365\frac{1}{4}$ days to complete the journey. This is the yearly or **annual movement** of the earth. Both the daily movement and the annual movement of the earth have important consequences. These will be considered in the next chapter.

Eight planets, including the earth, are known to exist. Mercury and Venus are nearest to the sun. The next planet is the earth with one satellite or moon, which revolves round the earth. Then come Mars, rather less than the earth with 2 little moons, and Jupiter, a huge planet 17 times as large as the earth with 9 moons. The next planet, Saturn, is surrounded by a ring and it has 10 moons. Further away still are Uranus, with 4 moons, and Neptune with one moon.

There is also a swarm of very small planets, revolving in an orbit between that of Mars and Jupiter.

These planets *belong*, as it were, to the sun. They revolve around him. He is the source of their light and heat. Planets and sun together constitute the **Solar System.** The stars may be centres of other systems of a similar kind.

It is wonderful to think of these great planets revolving in space, each keeping to its proper orbit. What is it that maintains order in the solar system ? It is the kind of force that makes a stone fall back to earth when it is thrown upwards ; it is the force that holds the oceans on the earth and that prevents us from falling off the rotating earth. That force is called **gravitation.** The sun, planets, and other heavenly bodies attract each other. Each *pulls* the others and is pulled by them. The result is that each is kept in its own orbit.

It is believed that the moon was formed by separating from the earth. That would take place before the earth became hard and solid. The moon was gradually pulled into its orbit 240,000 miles from the earth.

Like the earth, the moon has two movements—rotation and revolution. Each occupies about 4 weeks, so that the moon has the same portion of its surface (a hemisphere) always towards the earth. This portion has been well examined by means of telescopes. It has mountains, valleys and plains, but no rivers, lakes or seas; and there is no atmosphere round the moon. It is like a dead world.

In some respects the moon is more interesting even than the sun. Everybody loves to see the moon passing through its phases. To

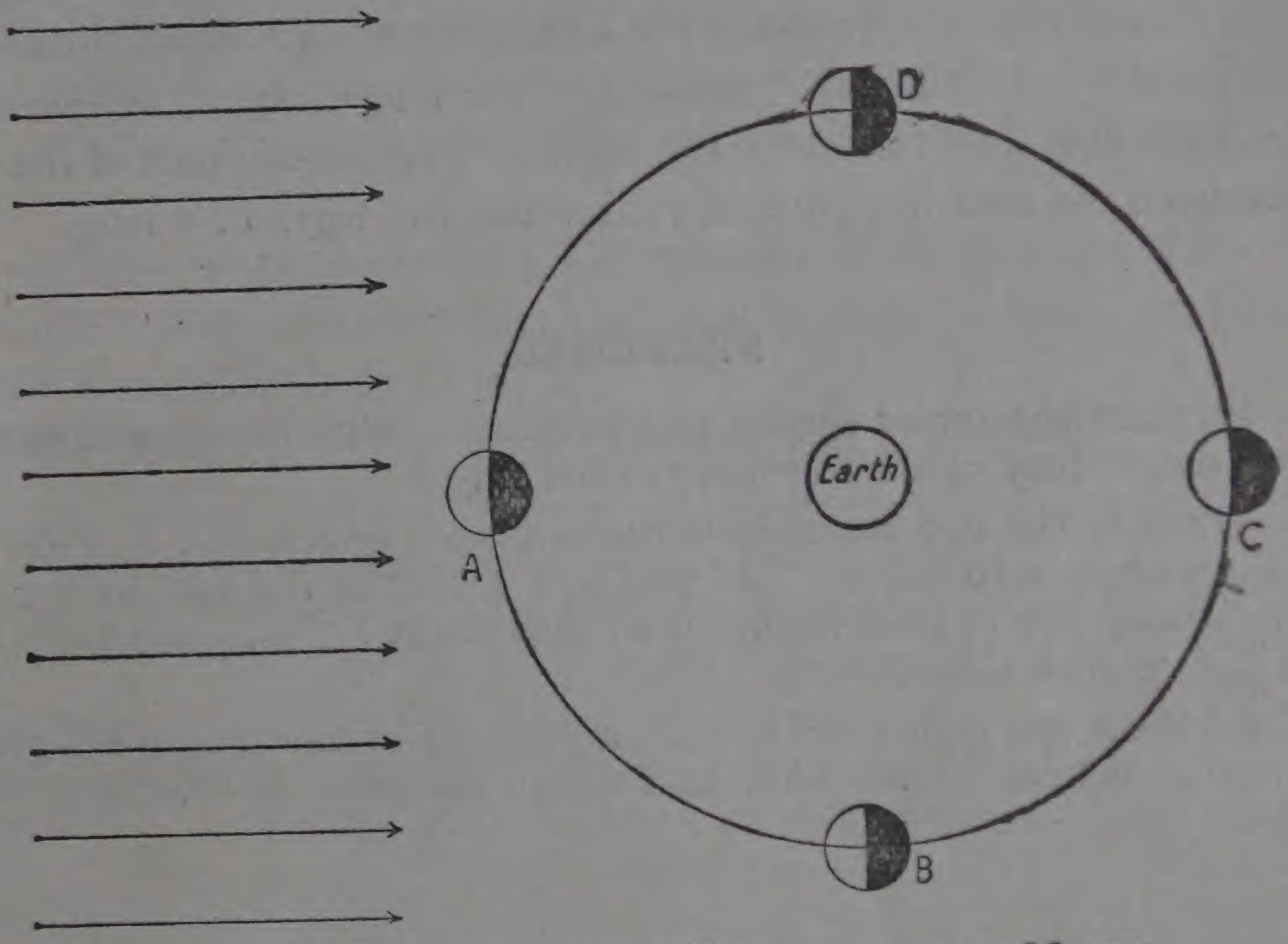

FIG. 8.—TO EXPLAIN THE PHASES OF THE MOON.
The parallel lines show the direction of the Sun's rays.

illustrate the phases of the moon obtain a wooden ball. Whiten half of its surface with chalk. Hold the ball up so that you can see half of the whitened portion. Now rotate the ball slowly, so that you see a white crescent. This narrows and finally disappears. Continue rotating and the crescent appears reversed on the opposite side. It increases until the whole white portion is in view.

Such changes does the moon show us, due to its revolution round the earth. When the moon is at *A* (Fig. 8), the illuminated half is turned *from* the earth. Its "face" is towards the sun and its "back" towards the earth. This is **new moon.** As the days pass

a crescent appears. It widens until when *B* is reached (**first quarter**) we see a "half moon," that is, half of the illuminated hemisphere. More and more of the light half is seen as the moon travels towards *C*, which is **full moon** position. Then the moon begins to wane. At *D*, **last quarter**, we again see a half moon, and this passes by a narrowing crescent to darkness again at *A*.

At "new moon" the moon is somewhere between the earth and the sun, but not always in the direct line joining these two. When it does happen that earth, moon and sun are in a straight line, there is an "eclipse of the sun." If the shadow of the moon reaches the earth, the sun is obscured—for a short time—at places where the shadow falls. During an "annular" (or ring-shaped) eclipse, the moon's shadow does not reach the earth. The central part of the sun is obscured, so that the portion visible has the form of a ring.

EXERCISES

1. Explain the terms zenith and horizon. Why does a seaman on "look-out" duty climb the mast of his ship?

2. What is the difference between a planet and a star? How do the stars appear to move? If you saw a star in the east at 9 p.m., where would you expect to find it at mid-night? Why are stars not seen during day-time?

3. Explain the terms, solar system, phases of the moon, eclipse of the moon, eclipse of the sun, and make sketches to illustrate your answer.

III. THE EARTH'S MOVEMENTS, AND THEIR CONSEQUENCES

The earth has two movements: a daily movement upon **its axis** which is called **rotation**, and an annual movement in its orbit round the sun, which is termed **revolution.**

Rotation of the earth causes night to follow day with unfailing regularity. The sun illumines half the world at once; this means that the realm of light extends for 90° in every direction from the point where the sun's rays fall vertically.

There is no sharp line of division between the dark and illuminated halves; this we know from our own experience in travelling

from light to darkness every day. For the sake of simplicity, however, we shall assume that the boundary between the two is quite definite; this boundary we may call the **shadow circle.**

Sunrise and sunset occur at any place when it passes beyond the shadow circle into light and darkness respectively. Midday occurs when the meridian of the place is brought directly "opposite" to the sun—at that moment the line joining the centres of the earth and the sun passes through some point on the meridian.

The earth makes a complete rotation, 360°, in 24 hours; therefore it turns through 15° per hour. **Fifteen degrees of longitude are equivalent to one hour of time.** Thus meridian 90° E. is brought into noon position, one hour earlier than meridian 75° E.; and 75° E. arrives in position one hour before 60° E., and so on.

Thus rotation of the earth gives a **means of measuring time.** To make the matter clear consider the time at some well-known places when it is noon at Dacca (90° E.).

(*N.B.* The longitudes in the table are approximate.)

Place.	Longitude.	Time.
Fiji - - -	180° E.	6 hours "post meridian" = 6 p.m.
Fu Chau - -	120° E.	2 ,, ,, ,, ,, = 2 p.m.
Dacca - -	90° E.	Noon, sun on the Meridian.
Mangalore -	75° E.	1 hour "before meridian" = 11 a.m.
Khiva - -	60° E.	2 hours ,, ,, = 10 a.m.
Baghdad - -	45° E.	3 ,, ,, ,, = 9 a.m.
London - -	0	6 ,, ,, ,, = 6 a.m.

a.m. = ante meridian, p.m. = post meridian.
meridian = middle of the day.

In the case of a wide country—one that extends through many degrees of longitude—**local time** will vary because the sun will be on the meridian at different times in different places. To secure uniformity of **clock time** a meridian near the middle of the country is selected, and noon for the whole country occurs when the sun is on that meridian. The United States and Canada are, however, so very wide that they are divided into zones, each zone taking its time from the meridian near the middle of the zone.

In the case of India it is legal noon in all parts of the country when the sun is on meridian $82\frac{1}{2}°$ E. Now $82\frac{1}{2}° = 5\frac{1}{2} \times 15°$, therefore Indian Standard Time is $5\frac{1}{2}$ hours *fast* on Greenwich time.* It should be noted that the meridian of Greenwich is recognized as a reference meridian for the world.

Time in Burma is $6\frac{1}{2}$ hours, and in Japan 9 hours *fast* on Greenwich; whilst Madeira is 1 hour and Jamaica 5 hours *slow* on Greenwich.

We must now notice the consequences of the revolution of the earth.

In diagrams the path or orbit of the earth is usually drawn as a circle. This is not quite correct, for the orbit is an ellipse. Still, the orbit drawn correctly on a small scale could hardly be distinguished from a circle. The sun is at one of the foci of the ellipse. The earth is therefore nearer to the sun at one part of the year (December) than at other times (Fig. 12).

But there are two more important facts than that to mention: (1) *The earth travels with its axis tilted towards the plane of its orbit, to the extent of* $23\frac{1}{2}°$; (2) *the axis always points towards the same fixed point in space—the Pole Star.*

To understand the importance of these laws, think what would happen if the earth were to begin travelling with its axis "upright." The sun's rays would always fall vertically upon the equator; the shadow circle would always pass through the poles and all places in the world would have 12 hours daylight and 12 hours darkness every day; hot and cool seasons would no longer follow each other; all places would have a hot, cool or cold climate, according to their position, throughout the year.

But the earth's axis is tilted $23\frac{1}{2}°$ and as it points always to the Pole Star, its tilt is towards the sun in June, and away from the sun in December. The sun therefore "swings" between $23\frac{1}{2}$ north and $23\frac{1}{2}°$ south of the equator. In other words the sun's **declination** (= distance from the equator) varies from $23\frac{1}{2}°$ N. to $23\frac{1}{2}°$ S. Lines drawn round the globe in these latitudes mark the limits of the sun's northward or southward journey. They are therefore called **tropics** ("turning lines"), the tropic of Cancer in the north and the tropic of Capricorn in the south.

The dates on which the sun stops his northward and southward

* Only $4\frac{1}{2}$ hours *fast* on Greenwich since 1 September 1942.

journeys, and on which he crosses the equator, should be carefully noted :

Sun in zenith at Equator (going north) - - - - -	March 21,	Spring Equinox.
Sun in zenith at Tropic of Cancer,	June 21,	Summer Solstice.
Sun in zenith at Equator (going south) - - - - -	Sept. 23,	Autumn Equinox.
Sun in zenith at Tropic of Capricorn - - - - - -	Dec. 21,	Winter Solstice (for northern hemisphere).

This variation in declination has two important results ; (1) it causes a variation in the length of day and night at all places in the world except the equator ; (2) it produces those changes of climate which we call the seasons. These results must be considered.

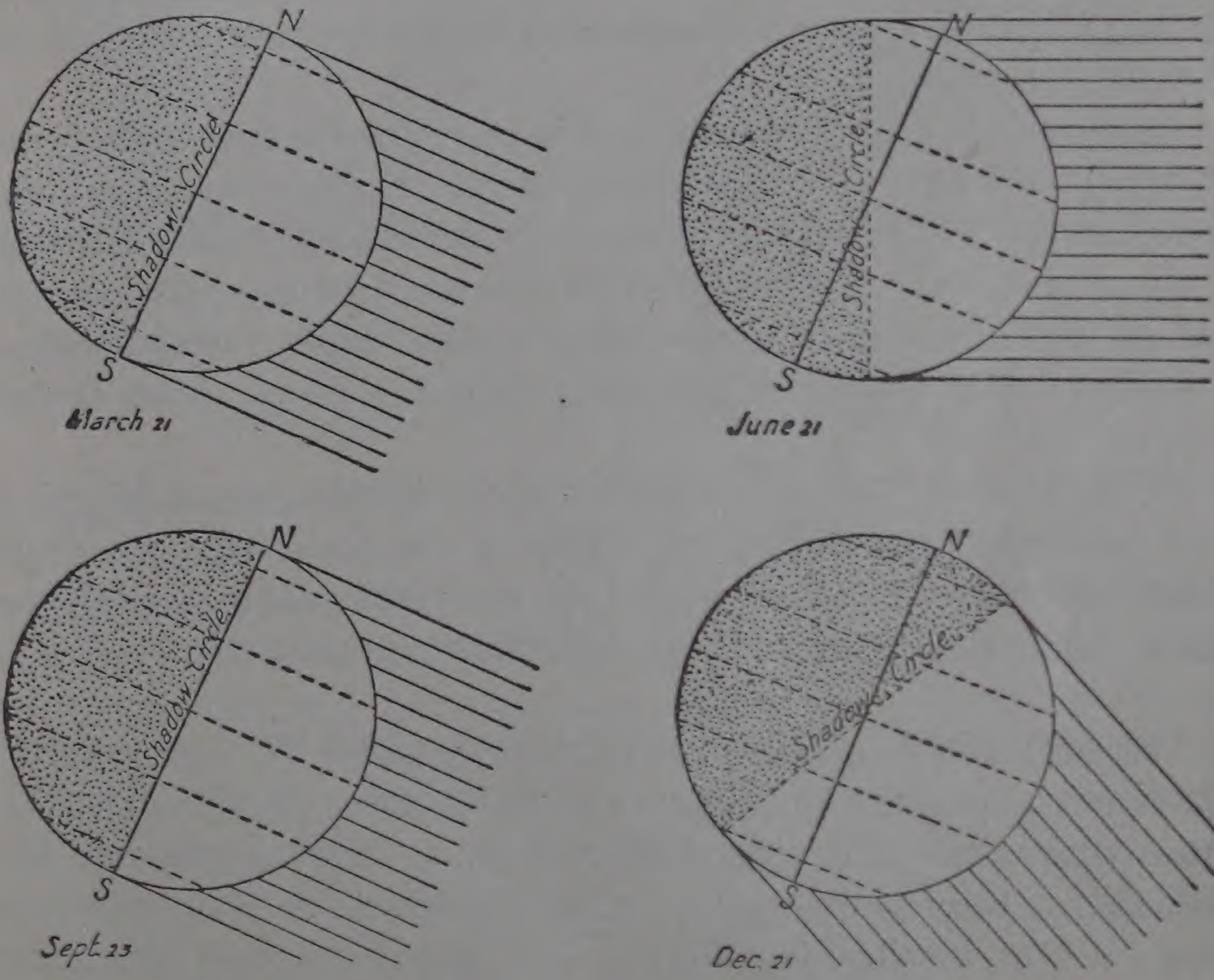

FIG. 9. HOW THE WORLD IS ILLUMINATED AT THE EQUINOXES AND THE SOLSTICES.
The parallel lines show the direction of the Sun's rays.

On March 21 and September 23, the shadow circle passes through both poles, and it bisects every parallel of latitude (see Fig. 9).

Consequently, during the rotation of the earth every place in the world has 12 hours daylight and 12 hours darkness; hence the use of the term **equinox** (equal night) for these two dates.

After March 21 the parallels are not bisected by the shadow circle. As the sun moves northwards the shadow circle gradually shifts. Day by day a little more of each parallel in the northern hemisphere is brought within the light; and a little more of each southern parallel is in the dark. That is, "days" are growing longer in the northern and shorter in the southern hemisphere. This continues until June 21, when the sun has reached the tropic, and the shadow circle has reached its extreme position (see Fig. 9). The whole of the Arctic Circle is now within the illuminated half of the world, and the whole of the Antarctic Circle is in the dark half. Thus there will be no sunset for any place on or within the Arctic Circle on June 21, and no sunrise for any place in the Antarctic region.

As the sun begins his southward journey the shadow circle begins to creep back again; but places within the Arctic Circle may rotate (with the earth) for days or even weeks, according to their latitudes, without a sunset. Hammerfest in Norway, for example, situated 70° 40′ N., has a midsummer day 9 weeks long—9 weeks without a sunset. But what a mid-winter night the people have to look forward to!

At the North Pole itself the period of daylight begins on March 21 and lasts until September 23. This is the time required for the shadow circle to creep through $23\frac{1}{2}°$ and back again. Each pole has 6 months daylight and 6 months darkness per year.

The heat which makes it possible for animal life and vegetable life to exist upon the earth comes from the sun. It does not travel those 93,000,000 miles as *heat*, but in a form of energy called **radiation**. Radiation waves, when absorbed by any substance, *produce* heat in that substance. The upper air, into which high mountains raise their summits, is too rarefied (thin) to absorb such waves. For the same reason it gains very little of the heat absorbed by the ground. That explains the coldness of the air at great altitudes; it explains why the Himalayas are snow-capped.

The lower air is dense, and it contains a quantity of solid matter

in the form of dust, as well as water vapour and other gases. It therefore absorbs more sun energy than does the upper air; still *the lower air obtains most of the heat it possesses from the sun-warmed earth.*

The heating power of the sun's rays depends largely upon the angle at which they strike the ground. Vertical rays have great heating power; the more slanting the rays the less is their effect upon the earth. This is observed daily. The slanting rays from the rising and setting sun seem much less powerful than those he throws from his high position at midday.

The upper part of Fig. 10 shows, in section, three equal bundles of rays, striking level ground at angles of 90°, 60° and 30°. *PQ* is

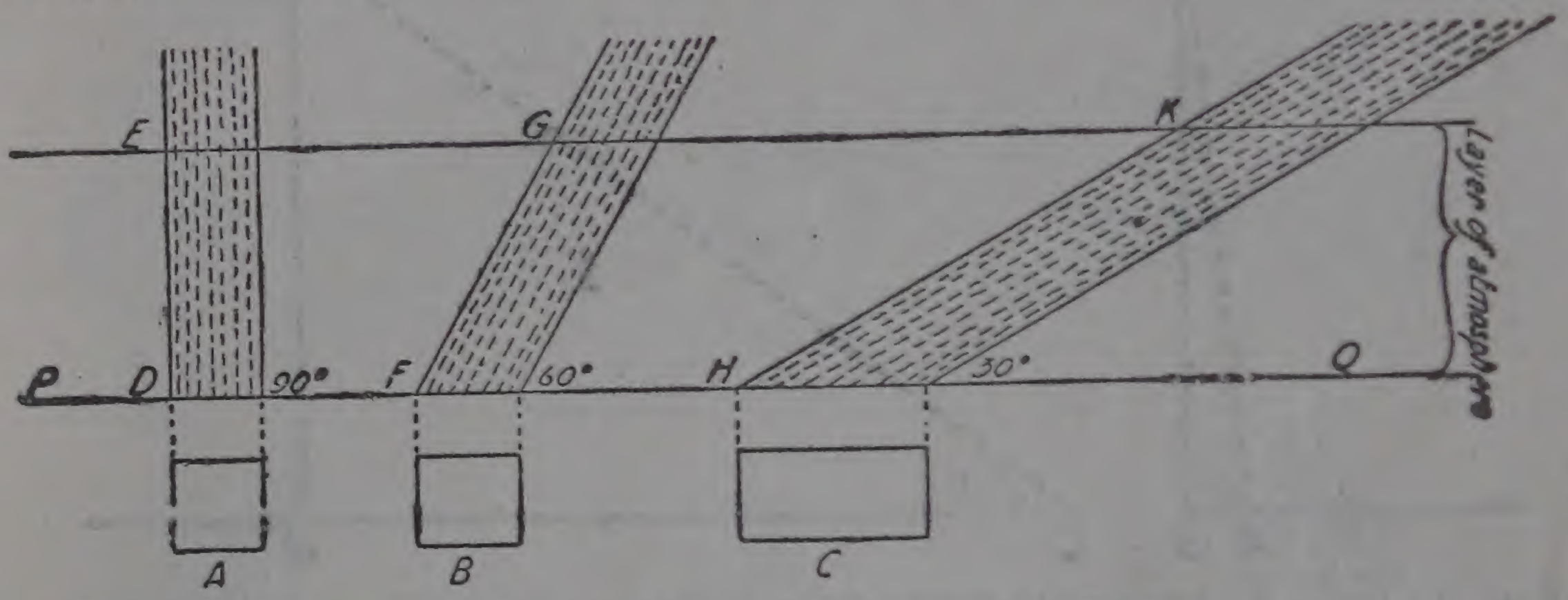

FIG. 10.—SLANTING AND VERTICAL RAYS.

the ground line. Below the ground line are drawn the areas upon which the rays fall. It will be noticed that the more slanting the rays the greater the area they have to cover. Rectangle *C* is twice as large as *A*, therefore a square inch of *C* will receive only half the quantity of heat received by a square inch of *A*. But there is something else. The journey of the slanting rays through the atmosphere (*KH*) is longer than that of the vertical rays (*ED*). Because of this they are *weaker* than the vertical rays when they reach the earth. Thus a square inch of *C* will receive *less* than half the amount of heat received by a square inch of *A*.

Summing up we may say, (1) Slanting rays have less heating power than vertical rays, (*a*) because their energy is spread over larger areas; (*b*) because they lose more energy on their way to the earth. (2) The greater the slant of the rays the less is their heating power.

Let us see how the facts which we have learned affect such a place as Delhi (29° N.). Suppose a rod 6 feet long to be placed upright in the ground at Delhi. At noon on December 21, its shadow will be nearly 8 feet long, but on June 21 only 7 inches long. Diagrams drawn to scale as below, will enable us to find the altitude of the sun on each date, and they will also show the slant of the rays. On June 21 the altitude of the sun is $84\frac{1}{2}°$, and the rays are nearly vertical; on December 21 the sun's altitude is $37\frac{1}{2}°$, and the rays are very slanting.

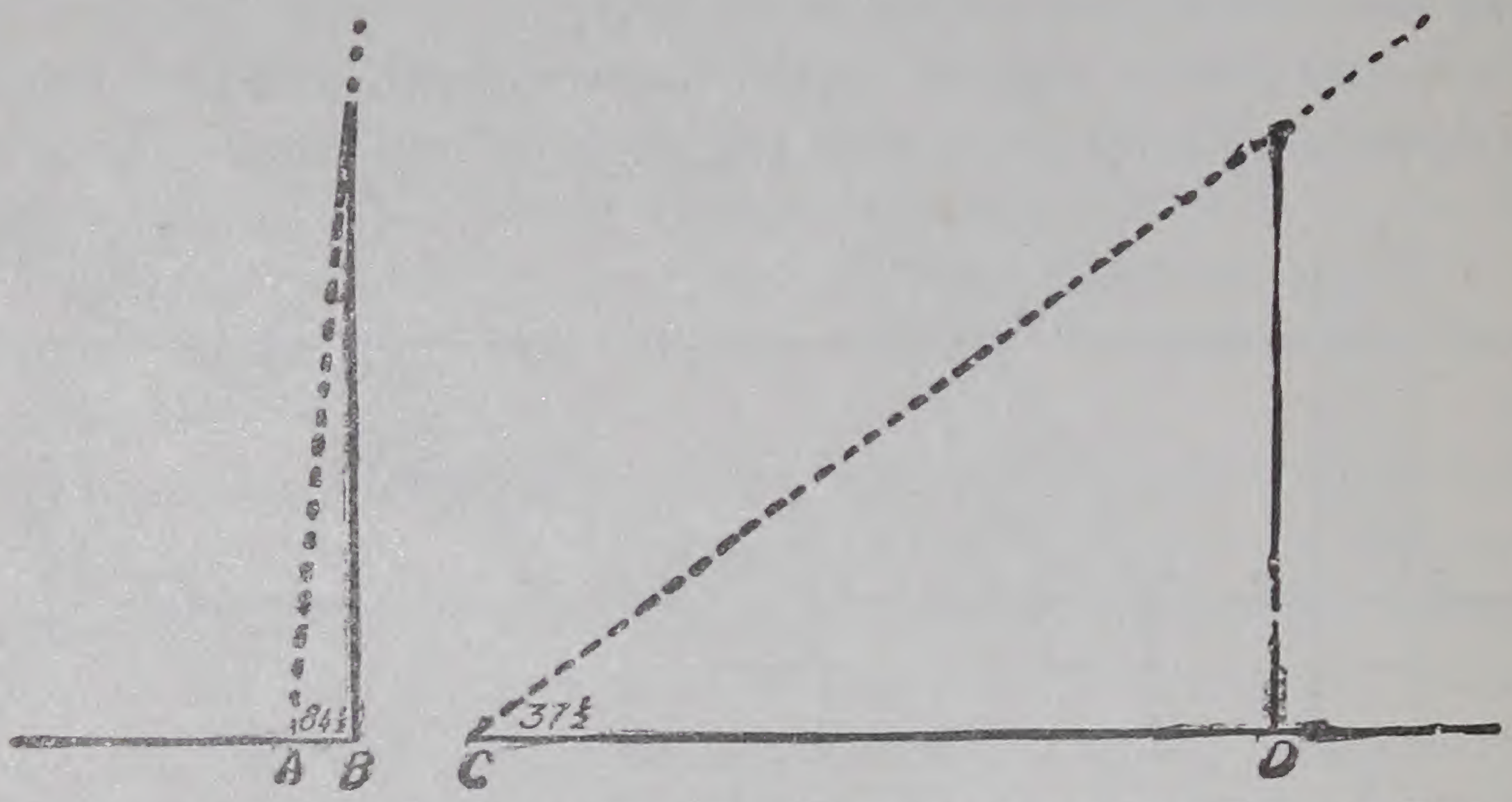

FIG. 11.—LENGTH OF SHADOW OF A ROD CAST BY THE SUN AT DELHI.

AB = length of shadow, 21st June.
CD = length of shadow, 21st December.
The dotted lines show the slant of the Sun's rays.

This accounts for the change of seasons. The mean temperature of Delhi is 92·2° in June, 59·6° in December, and the main cause of the difference is the change in the slant of the sun's rays. It should be noticed that when we speak of the temperature of a place, we mean the temperature of the air at that place.

The farther a place is from the point where the sun is in the zenith, the more slanting are the rays. Thus insolation, that is, the solar energy received by the earth, becomes less and less as we go from the place where the sun is overhead.

In northern lands the sun's rays are least slanting towards the end of June and most slanting near the end of December. This is true for that part of India north of the tropic of Cancer. But in most cases the warmest month is July and the coldest is January. This

is easily understood. In July the sun's altitude is very little different from what it was in June, and the heat previously absorbed by the earth is having its effect upon the atmosphere. In January the altitude has changed only slightly since December 21, and the land has become very cool.

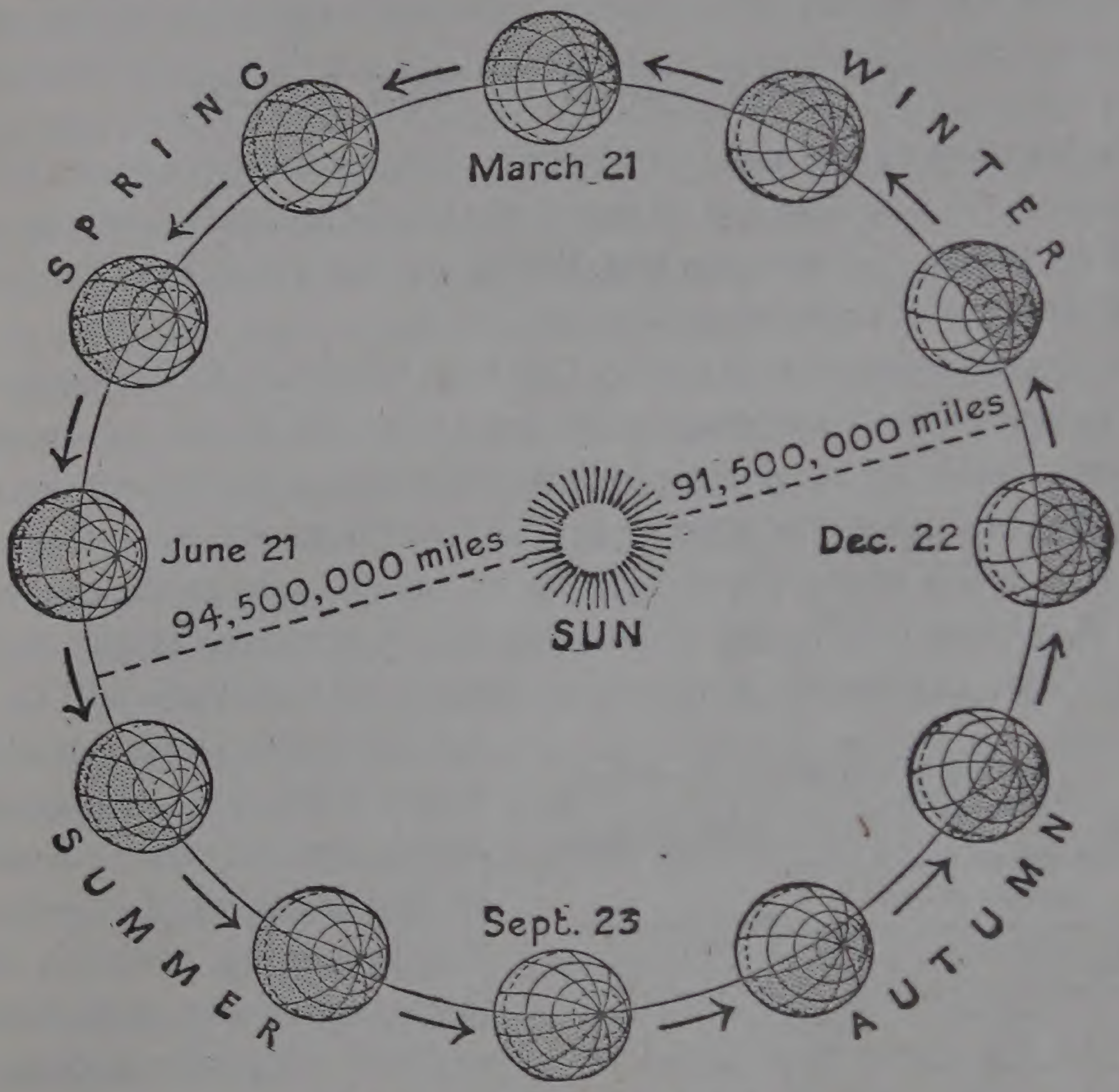

FIG. 12.—THE SEASONS.

We have found that at Delhi the sun's altitude varies from $37\frac{1}{2}°$ in December to $84\frac{1}{2}°$ in June. The difference is $47°$, equal of course to the distance between the tropics. There must be the same variation at all other places outside tropical regions, and corresponding variation in seasons. Further reference will be made to this in the next chapter.

EXERCISES

1. What is meant by (*a*) the revolution of the earth, (*b*) the rotation of the earth? How long does each movement take? What are the chief consequences of each?

2. When it is 6 a.m. in Calcutta what time is it in Colombo (80° E.), and in Rangoon (96° 15′ E.) ?

3. Explain why slanting rays from the sun have less heating power than vertical rays, and illustrate your answer with diagrams. Which parts of India never receive vertical rays ?

IV. THE ZONES OF THE EARTH

The journey of the sun between the tropics brings about changes of season. It has also led to the division of the surface of the earth into five zones. These are the **Torrid** or hot zone, two **Temperate** zones, and two **Frigid** or cold zones.

The torrid zone lies between the two tropics. It is bisected by the equator. Summarising what we know about the sun and this zone, we find : (1) At every place in the torrid zone the sun is in the zenith twice during the year. (2) The sun is never more than $23\frac{1}{2}°$ from the zenith of the Equator, that is, his altitude at the equator is never less than $66\frac{1}{2}°$. (3) When the sun is over one tropic, he will be 47° from the zenith of the other tropic—his altitude will be 43°. (4) The sun's altitude is always more than 43° at places *between* the tropics. Remembering what we discovered in the preceding chapter, these facts are quite sufficient to explain why the middle belt of the earth has a hot climate.

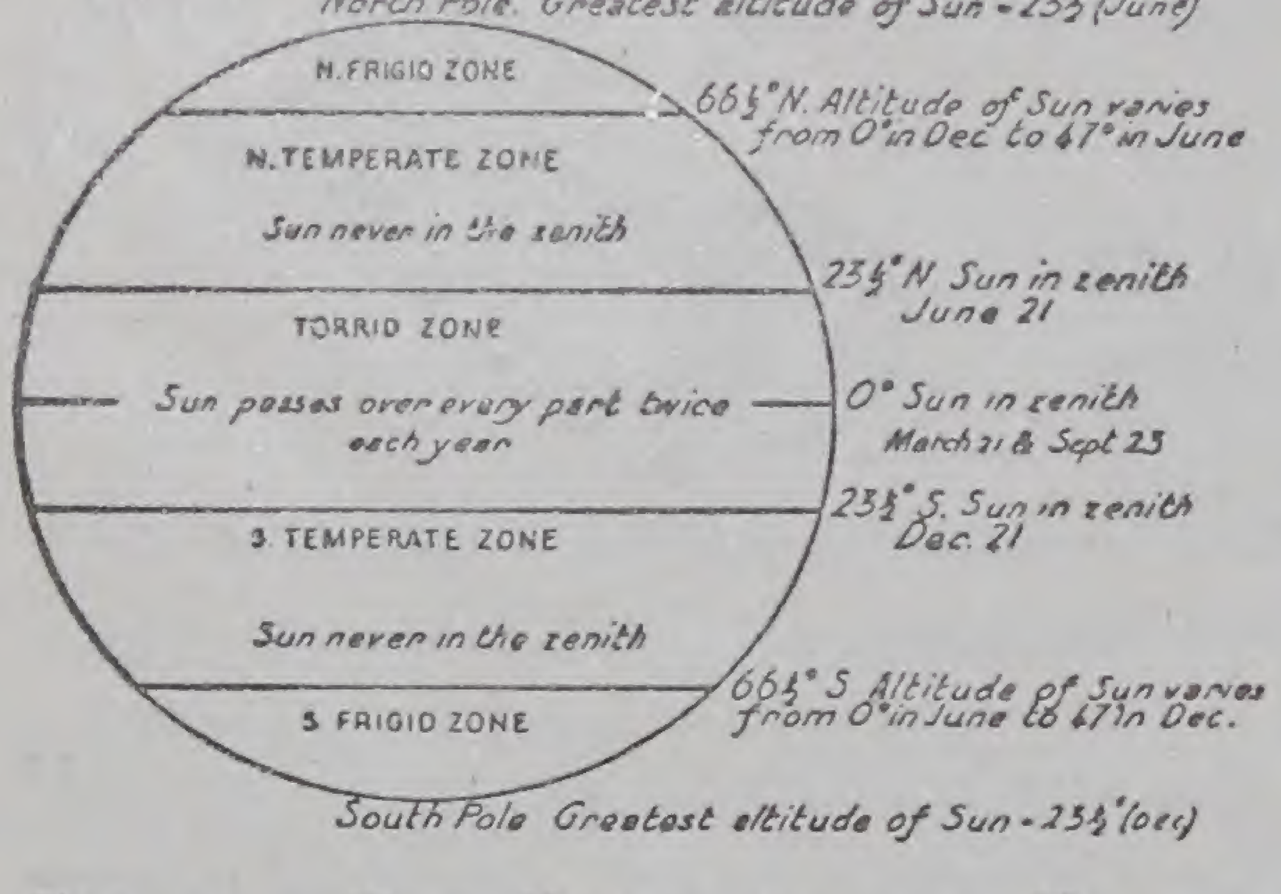

FIG. 13.—THE ZONES OF THE EARTH.

The North Frigid Zone lies within the Arctic Circle ; the North Pole is at its centre. What is known about the sun with reference to this region ? (1) All places in the frigid zone have at least one day in the year on which the sun does not appear above the horizon. (2) The number of sunless days increases towards the pole, where there is a six months' "night." (3) The greatest altitude of the sun (June 21) is 47° at the Arctic Circle, $23\frac{1}{2}°$ at the pole. It is therefore not surprising to learn that over a large part of this region the temperature is below freezing-point

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for the greater part of the year. Rivers, lakes, seas and even the ground are frozen for 6 months or more, whilst a large area round the pole is never free from snow and ice. Such is the north frigid zone, and similar conditions prevail in the south frigid zone—the "home of the blizzard."

The north temperate zone lies between the tropic of Cancer and the Arctic Circle, and the south temperate zone between the southern tropic and the Antarctic Circle. Belts of these zones near to the tropics do not differ much in climate from the torrid zone; they are often described as **sub-tropical** regions. Similarly the belt south of the Arctic Circle is called the **sub-Arctic** region. There is no expanse of land just outside the Antarctic Circle.

With regard to the temperate zones we know: (1) The sun is never in the zenith. (2) The sun never fails to "rise." (3) Summer is a season of long days and short nights, winter is a season of short days and long nights; London, for example, ($51\frac{1}{2}°$ N.), has a midsummer day with 16 hours daylight, and midwinter day of 8 hours daylight.

These facts show that the temperate zones are intermediate in climate between the torrid and frigid zones. With certain exceptions, they are as their name indicates, belts in which the climate is not excessively hot in summer and not extremely cold in winter.

Summarising our knowledge of the zones and adding particulars of typical vegetation we get:

Torrid Zone: Always hot. Region where palms, the rubber tree, banyan, baobab and bread-fruit trees grow.

Temperate Zone:

(*a*) Sub-tropical (*i.e.* near the tropic). Long hot summer, short cool winter. Region of the olive, vine, orange, pomegranate. Maize, wheat and rice cultivated.

(*b*) Central. Warm summer, cool winter about equal in length. Region of the oak, elm, beech and other deciduous trees. Wheat and oats cultivated.

(*c*) Sub-Arctic (*i.e.* near Arctic Circle). Short warm summer, long cold winter. Region of pines and firs. Wheat cannot be grown.

Frigid Zone: Always cold—central part ice-bound. Stunted trees gradually give place to shrubs, which in turn give place to mosses and lichens.

Many a high mountain in the torrid zone is capped with snow. Kilimanjaro is an example. This African mountain is very close to the equator. At its base grow tropical plants such as palms and baobabs. In ascending the mountain, there are changes in climate and vegetation like those noted between the equator and the pole. There is a sub-tropical belt, a deciduous tree belt, a coniferous tree belt, and, below the region of everlasting snow, a belt where mosses and lichens grow. Changes of the same kind occur in ascending the Himalayas.

EXERCISES

1. What is meant by Torrid zone, Temperate zone and Frigid zone? What are the boundaries of each?

2. Name some trees which characterise the three zones named in Question 1. Whereabouts in the Torrid zone are the climatic conditions like those of the Frigid zone?

V. WORK DONE AT A WEATHER OFFICE

Weather observations are made in all civilised countries. Study of the laws and facts so learned is called **meteorology**, the science of the atmosphere. Much of the work is now done to furnish information to aviators, but the results are very important to geography. We shall consider that part of meteorology which most affects our subject.

Information about weather is collected at a large number of stations—**meteorological stations**—distributed over a wide area. The readings taken at these stations are sent to a central office or headquarters. Here the records of a whole country are examined, and used in making maps and charts.

Chief amongst the records are those of temperature, pressure, rainfall, humidity or dampness of the air, direction and force of the wind and hours of sunshine. We shall refer to the first three of these most often in later chapters. We must therefore learn something about them now.

Temperature, the "hotness" (or "coldness") of the atmosphere is measured by the thermometer. The thermometer used at weather stations has the Fahrenheit **scale**—boiling point 212° and freezing point 32°.

The **maximum** or highest, and the **minimum** or lowest temperature are recorded daily. Take the maximum and minimum temperatures of a place on any day. Add them together and divide by two. The result is the **mean temperature** of that place, for that particular day.

Add together the mean daily temperatures for a month, divide the total by the number of days in the month, and you find the **mean monthly temperature.** Similarly, from the mean monthly temperatures you can find the mean annual temperature.

It always happens that a number of places have the same mean temperature. When a temperature map is made, such places are joined by a line. That line is an **isotherm**—an "equal heat" line. Monthly isotherms and annual isotherms are shown in atlas maps.

Mountaineers, and people who ascend to great altitudes in balloons or aeroplanes, find that the temperature of the atmosphere

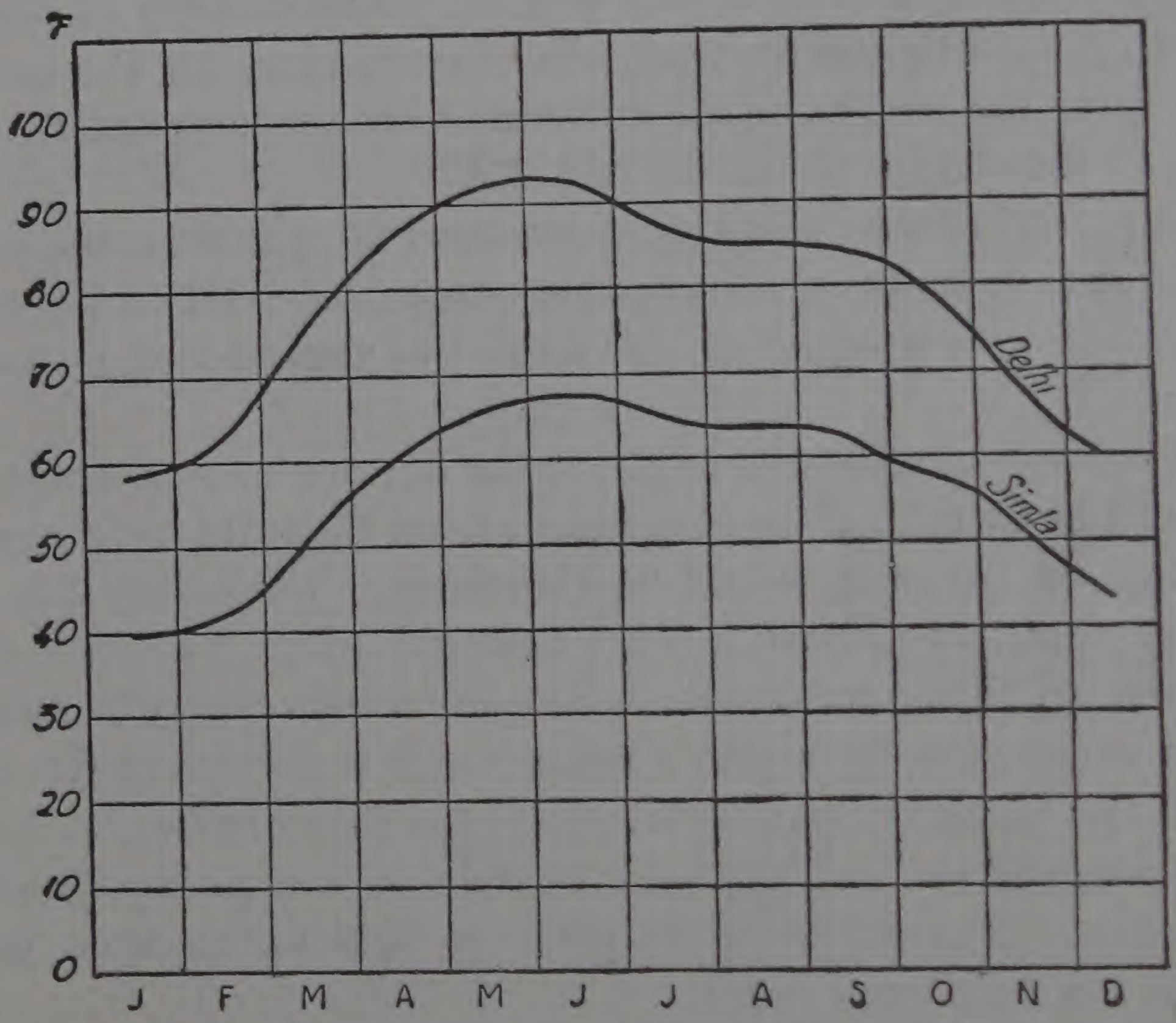


FIG. 14.—GRAPHS SHOWING THE MEAN MONTHLY TEMPERATURE AT DELHI AND SIMLA.

falls as they ascend. The rate at which it falls is about 1° F. per 300 feet. An aviator starting from sea-level when the thermometer reading is 70°, and rising to an altitude of 6000 feet, would find the

temperature to be 50° only. Delhi, about 700 ft. above sea-level, has a mean annual temperature of 77°, whilst that of Simla, 7000 ft. above sea-level, is 55°. (Refer also to Fig. 14.)

When the weather officer is preparing an isotherm map he makes proper allowance for the altitude of the stations which send him readings; that is, he draws **isotherms reduced to sea-level.**

Atmospheric **pressure** is recorded by the barometer, and it is expressed in inches or millibars (1000 millibars = 29·53 inches). The word barometer means "weight measurer," and the barometer really tells the weight of a column of atmosphere.

Take two glass tubes—*A* about 36 inches long and closed at one end, *B* about 8 inches long and open at both ends. Connect them as shown in (2) by a short piece of rubber tube. Now pour in mercury to about the level *c*. Next bend the rubber tube so that *A* comes into position (3). The mercury will adjust itself as shown, nothing remaining in the tube above *K*. The column of mercury *FK* is supported by the pressure of the atmosphere on the mercury at *E*. Thus the weight of the column of atmosphere resting on *E* is equal to the weight of the column *FK*.

When the barometer reading at sea-level is 30 inches, the weight of a complete column of atmosphere—from sea-level to the top of the ocean of air—is equal to the weight of the 30-inch column of mercury.

If the column of atmosphere above the barometer were shortened, as it would be by taking the instrument from Calcutta to Darjeeling, the column of mercury would be shortened. Darjeeling has 7000 feet less atmosphere above it than Calcutta has. The rate of fall of the mercury in the barometer is roughly **1 inch per 1000 feet.**

Water vapour is a light gas. When much is present in the atmosphere at any place, the barometer reading is below normal. Pressure and temperature are also related; changes in one produce changes in the other. But atmospheric pressure also varies from causes which are not fully understood.

One of the most important points to notice is that differences in pressure produce those movements of air called **winds.** The **wind blows from high to low pressure areas.** When the pressure is low over Central Asia and high over the Indian Ocean, the wind blows from sea to land; when the "high" and "low" are reversed, the

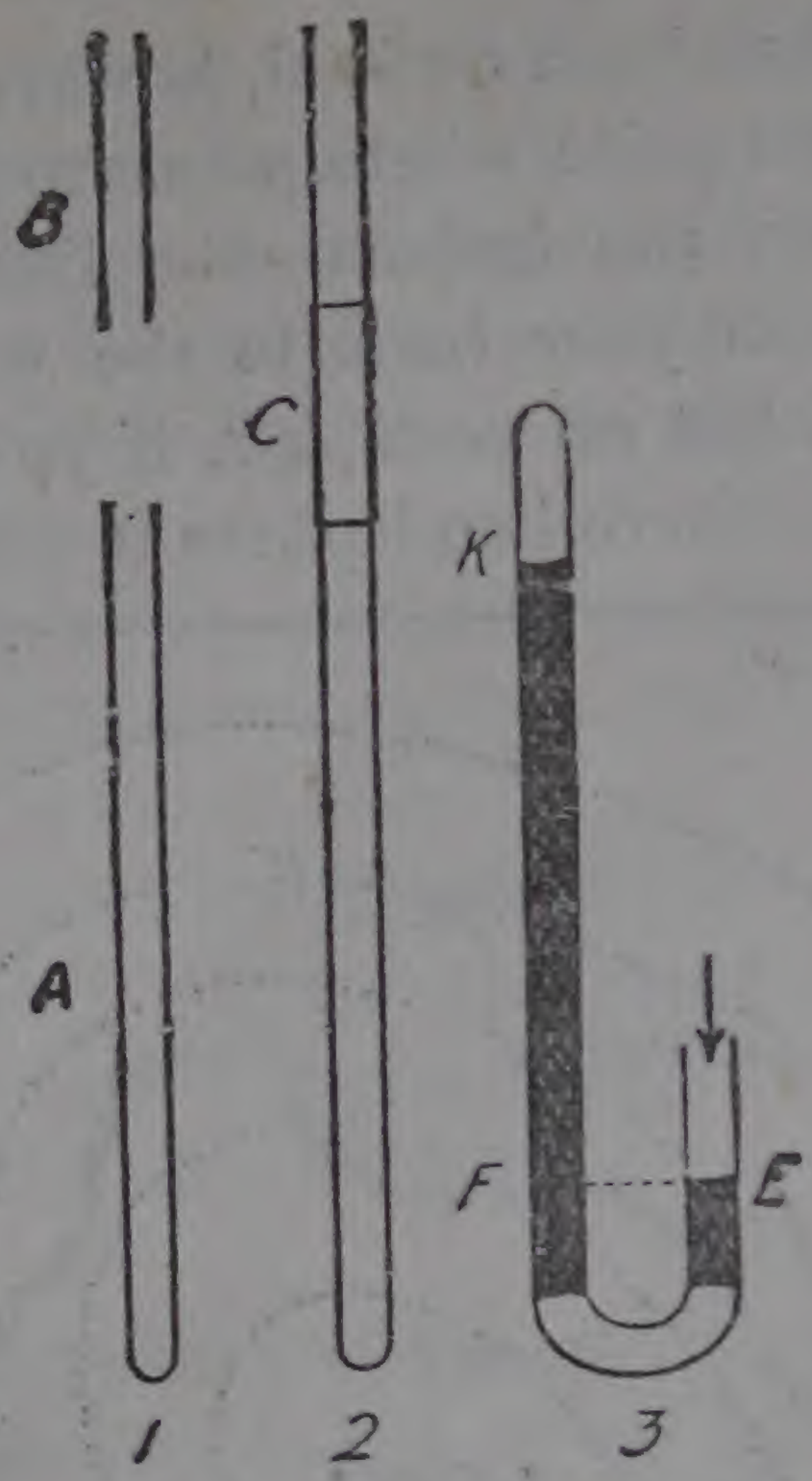


FIG. 15.—A SIMPLE BAROMETER.

The column of air which extends from *E* to the upper limit of the atmosphere, is just as heavy as the column of mercury *FK*.

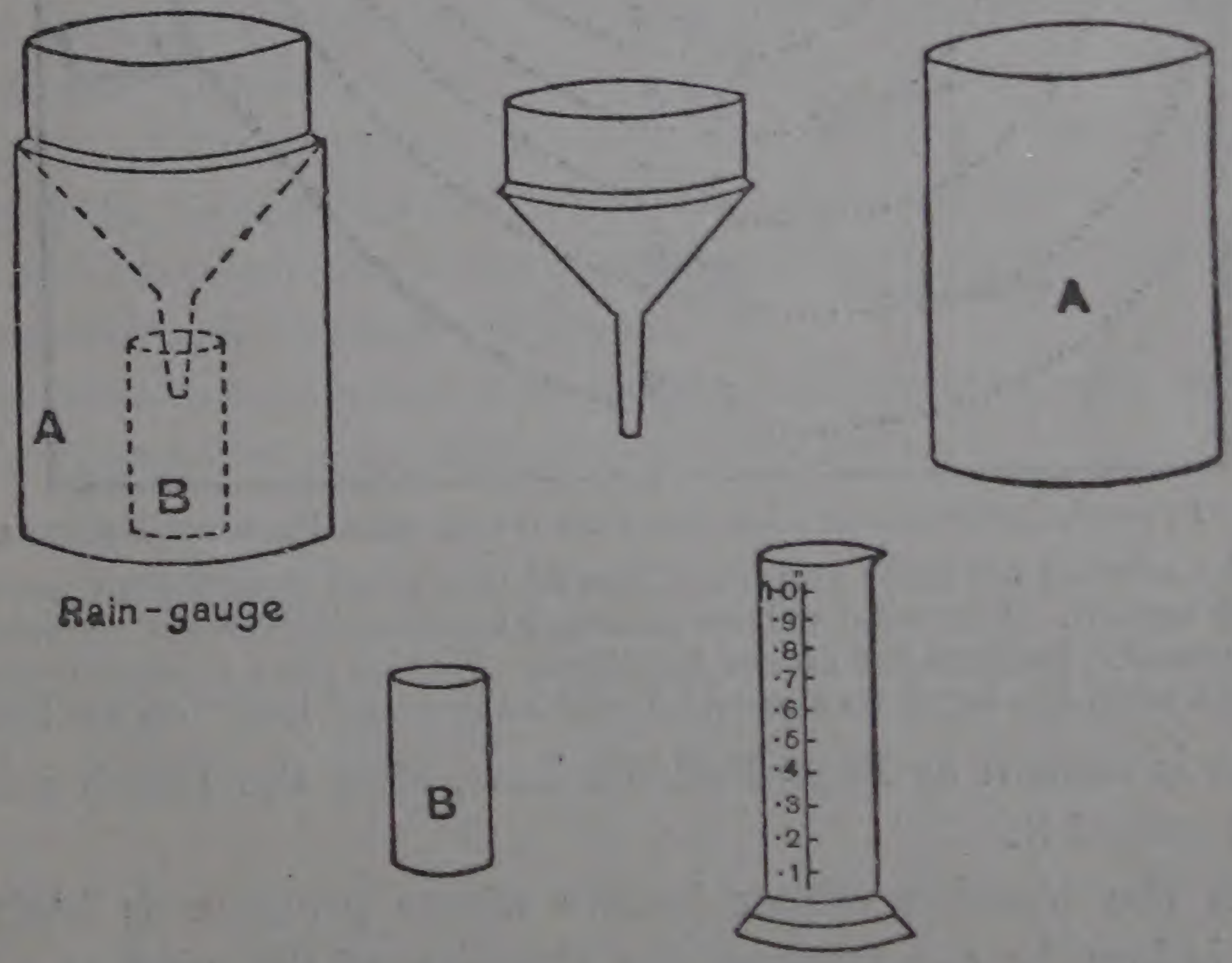


FIG. 16.—A RAIN-GAUGE AND ITS PARTS.

The measuring glass is drawn on a larger scale to show the graduations clearly. It will hold a quantity of water which, spread over an area equal to the top of the gauge, would be one inch deep.

wind is reversed. It has been noticed, however, that the wind does not blow directly to the point where pressure is lowest. The wind blows *slantingly* across the isobars—the lines of equal pressure. Thus if you stand with your back to the wind, the low pressure centre is not in front, but on your *left*, if you are in the northern hemisphere; in the southern hemisphere it would be on your *right*.

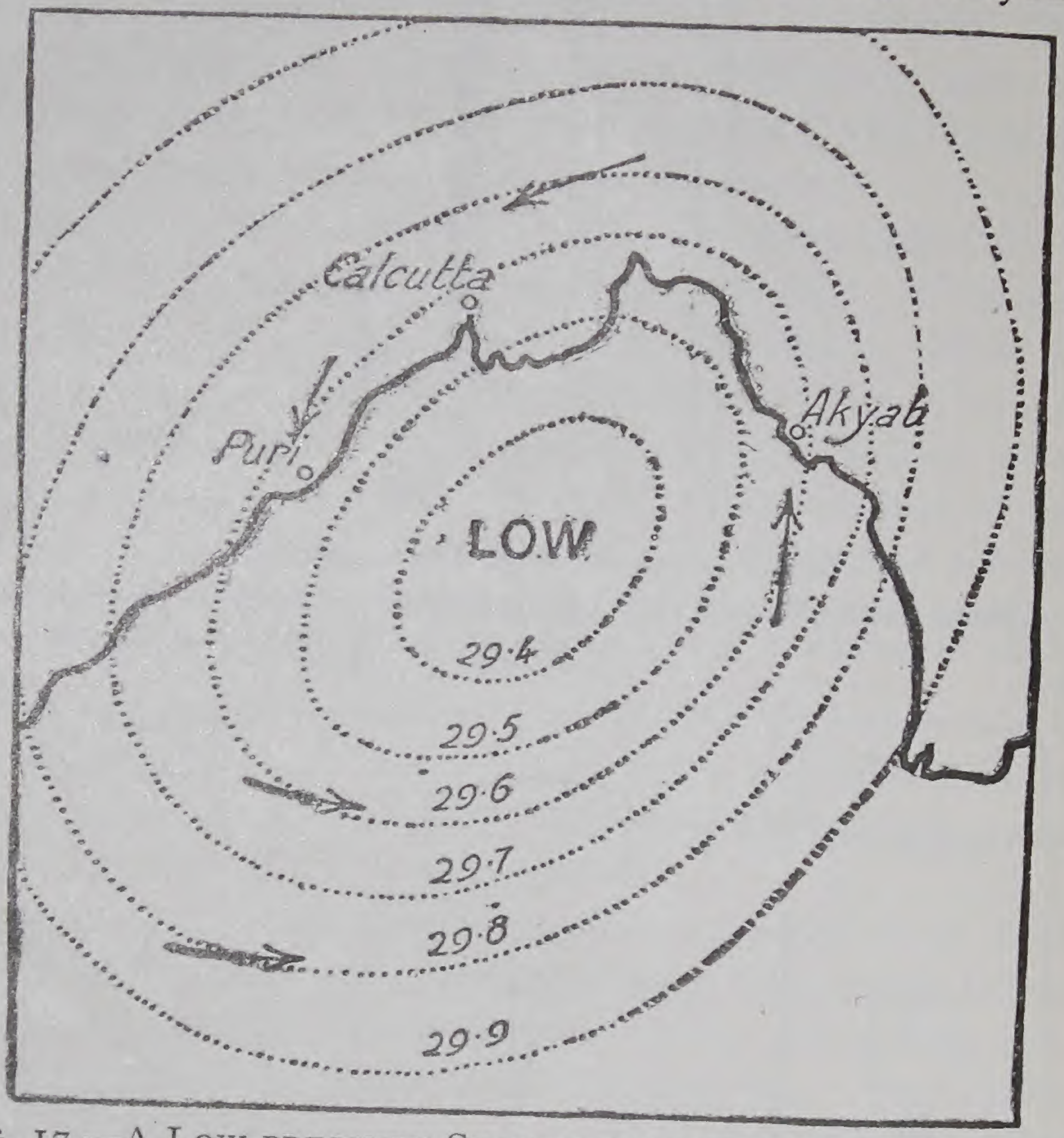


FIG. 17.—A LOW-PRESSURE SYSTEM OVER THE BAY OF BENGAL.

The arrows indicate the direction of the wind in different parts of the region. The wind will be stronger at Akyab than at Calcutta, because the isobars are closer together. Notice that a person who stands with his back to the wind will have the "low" on his left.

This rule is known as **Buys Ballot's Law**, after the Dutch scientist who first stated it.

If then the weather officer knows where pressure is high and where it is low, he can forecast the direction of the wind at a large number of places. He can also say what force the wind is likely to have, because the greater the difference of pressure between two points, the more swiftly will the air move from one to the other.

A very important part of the weather officer's work is measurement of **rainfall.** This is done by means of a **rain-gauge** (Fig. 16), The gauge is constructed to prevent loss by evaporation or in any other way. The gauge must of course be placed in an open position. It must not be shielded by buildings or vegetation ; and it must be examined every day.

The amount of rainfall is expressed in inches.

Rainfall varies greatly, even within the borders of one country, for reasons we shall mention later.

The **mean or average monthly rainfall** is found from the readings of a number of years. To find the mean rainfall for August, for example, obtain the August figures for the last 20 years, add together and divide by 20. If the readings for 40 or 50 years can be obtained so much the better.

Rainfall maps show districts where the mean monthly, seasonal, or annual rainfall is between certain limits—under 10 inches, between 10 inches and 20 inches, 20 to 30 inches and so on. Each such area is marked off by an **isohyet** or equal rainfall line.

Rainfall depends upon winds, which bring water vapour from the oceans over the thirsty land. Winds are the result of differences of atmospheric pressure, and one cause of pressure differences is difference of temperature in adjacent areas. Thus we see that temperature, pressure and rainfall are closely related.

We will conclude this chapter by describing the method of making temperature and rainfall diagrams.

The table below gives the mean monthly temperatures (to the nearest degree) of a number of places in India.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Colombo	79	79	81	81	82	80	80	81	80	79	79	79
Calicut	78	80	82	84	83	78	77	77	78	79	79	78
Bombay	74	75	78	82	85	82	80	80	80	81	79	76
Madras	75	77	79	84	89	88	86	85	84	81	80	76
Calcutta	65	70	79	85	86	85	83	82	83	80	72	65
Patna -	61	65	77	86	88	86	84	83	83	79	70	62
Delhi -	58	62	74	86	92	92	86	84	84	78	68	60
Simla -	39	41	51	59	66	70	64	63	61	57	50	43
Karachi	65	68	75	81	85	87	84	82	82	80	74	67

From the list we select Madras as an example. Taking a sheet of squared paper, we draw two reference lines at right angles, as shown in the figure. Along the vertical line we mark off equal distances. These we number to denote temperature. It is not necessary to begin with 0°. Along the horizontal line we write the names of the months (initial letters), at equal intervals.

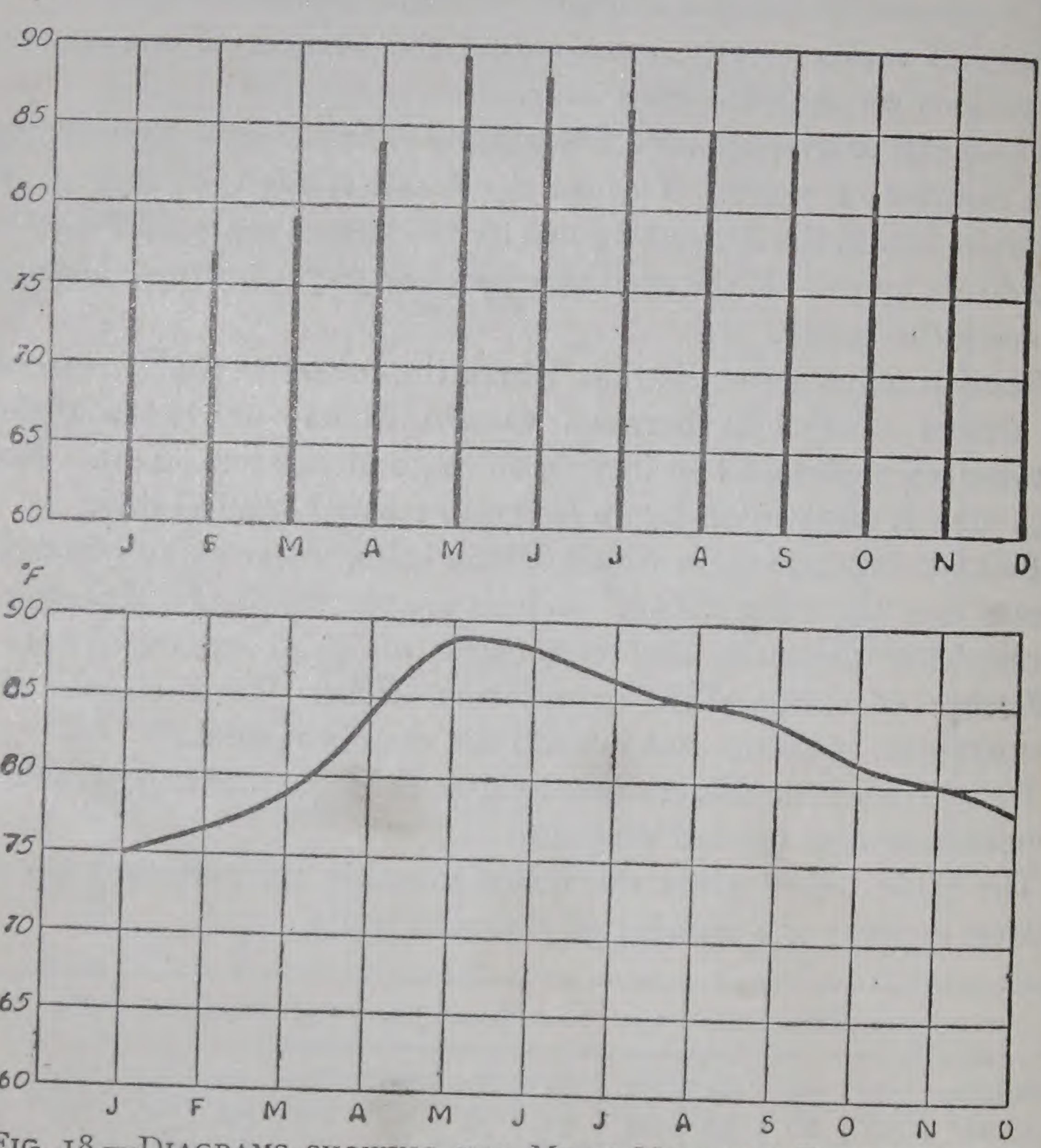


FIG. 18.—DIAGRAMS SHOWING THE MEAN MONTHLY TEMPERATURES OF MADRAS.

The mean January temperature of Madras is 75°. Thus at J we draw a vertical line, reaching the level of 75° marked on the reference line. The remaining temperatures are represented in the same way. The diagram shows how the mean monthly temperature of Madras varies during the year.

Now, instead of drawing a vertical line for each monthly temperature, we might put a dot to mark the position of the upper end of the line. Join these dots by a continuous line, and we get the graph shown in the figure. The graph tells us at a glance how the mean monthly temperatures vary in the course of a year.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Colombo	3	2	5	11	12	8	5	4	5	14	12	6
Calicut	·2	·2	1	4	9	36	29	15	7	9	4	1
Bombay	·1	0	0	·1	·5	21	25	15	11	2	·5	·1
Madras	·8	·3	·4	·6	2	2	4	5	5	11	13	5
Calcutta	·3	1	1	2	6	11	12	13	10	4	·6	·3
Patna -	·7	·5	·3	·3	2	8	11	11	8	3	·2	·1
Delhi -	1	·6	·7	·3	·7	3	8	7	4	·4	·1	·4
Simla -	3	3	3	2	4	8	18	18	6	1	·4	3
Karachi	·6	·3	·1	·1	0	·4	3	2	·7	0	·2	·2

The table above gives the mean rainfall to the nearest inch, except when the amount is less than 1.

Let us select Colombo this time as our example. We draw reference lines as before, and divide into equal portions. Number the intervals in the vertical line from 0 to 16.

The mean monthly rainfall for January is 3. Thus we draw a short horizontal line at this level. Mark the rainfall of the remaining months in the same way. Join the ends of these short lines, and shade the area so enclosed, as in the lower figure. This gives a bold rainfall diagram for Colombo. It shows clearly that Colombo has two wet seasons.

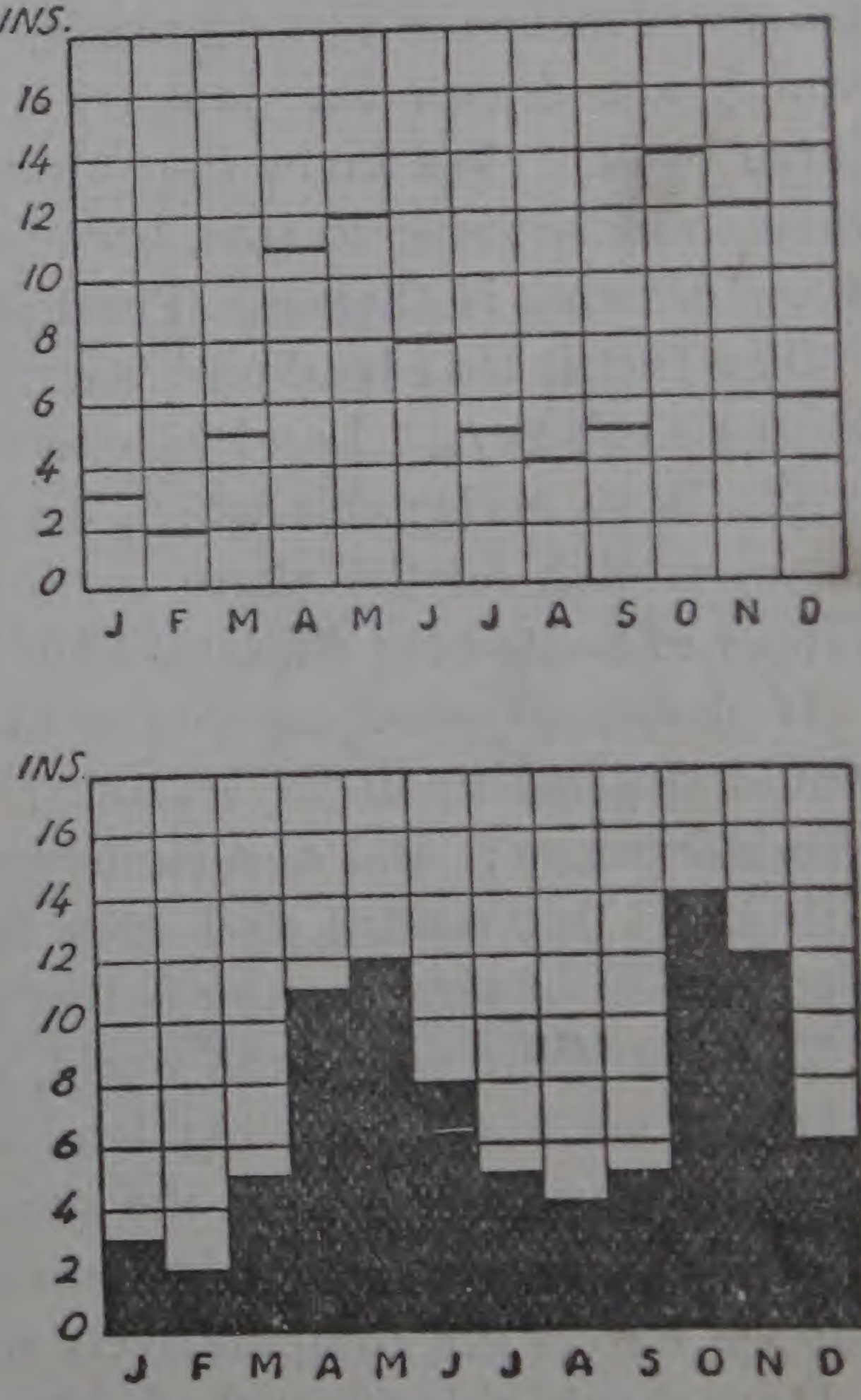


FIG. 19.—HOW THE RAINFALL DIAGRAM FOR COLOMBO IS MADE.

EXERCISES

1. Explain the terms isobar, isotherm and atmosphere pressure.

2. What apparatus is used to measure rainfall ? Illustrate your answer with sketches. What is meant by " one inch rainfall " ?

3. What is the cause of winds ? Explain how the direction of the wind can be forecasted.

4. Draw temperature and rainfall diagrams for the towns named in the tables in this chapter. Write a short account of the climate of each place.

VI. MARITIME AND CONTINENTAL CLIMATES

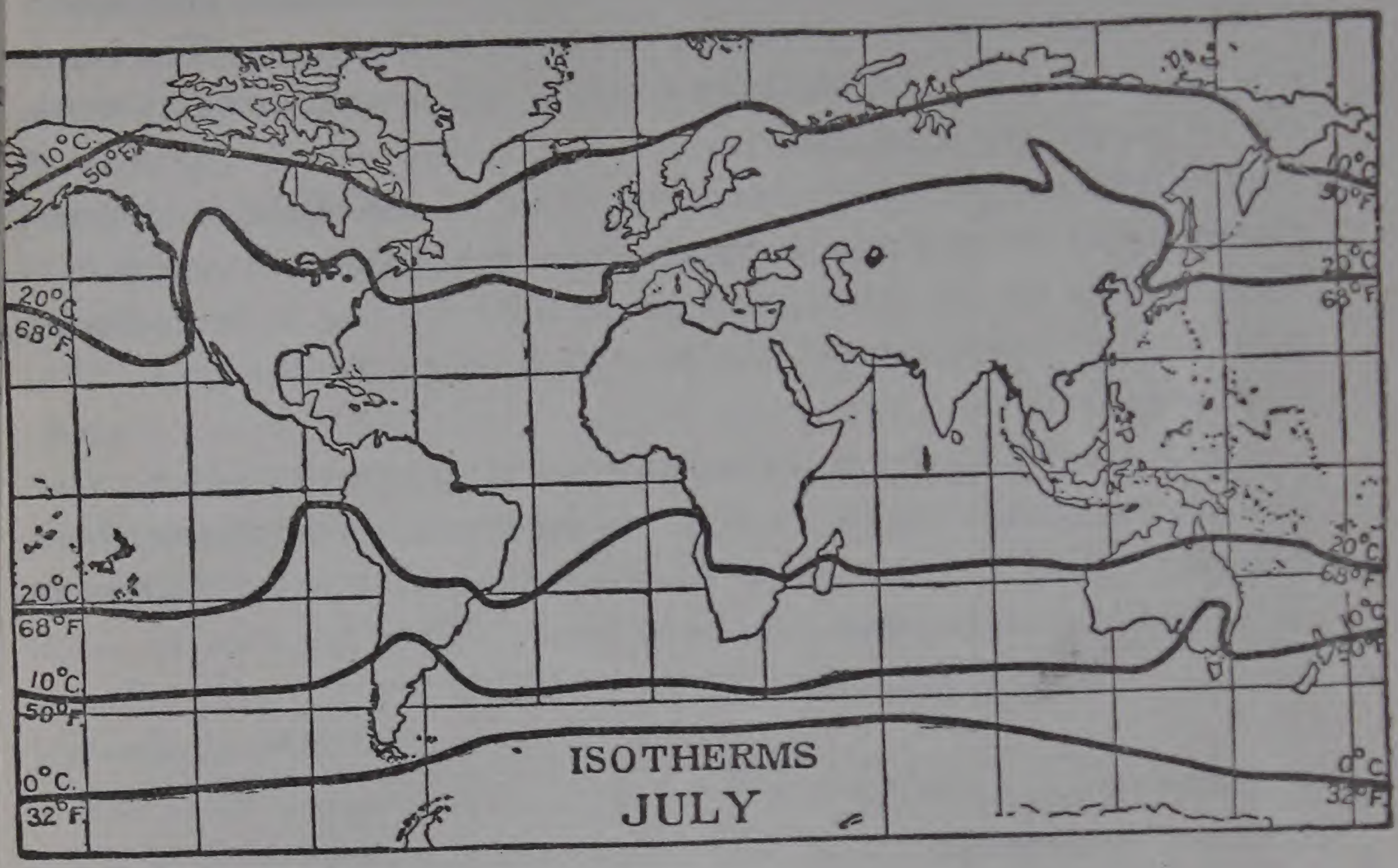
The surface of the earth has been divided into five zones. Still it would not be correct to say that all places in the same zone have the same kind of climate. There are great differences between places even in the same latitude. Look at maps of the world, on which are drawn the January and July isotherms. You notice large bends. We know that altitude affects temperature ; but the bends are not due to this, because allowance for altitude is made when drawing isotherms. There are other factors to be considered.

The fact is that land and water are not affected in the same way by the sun's rays. Land becomes hot in a shorter time than water does. You notice this when, on going to bathe in a river or the sea, you step off the warm earth into the cool water. When the supply of heat is cut off, land soon becomes colder than the sea.

If the earth were covered with water, the climate of any part would depend upon its latitude ; the five zones would really be *climatic* zones ; and the isotherms would run along parallels of latitude. But oceans and seas lie between land areas, and the distribution of temperature is therefore uneven.

Thus in going round the world, say along the 50th parallel north latitude, we notice two big land areas and two big water areas. All four receive heat from the sun. But in July the lands are hot and the waters are cool. In January the lands have become cold, but the waters are comparatively warm.

How should this affect the isotherms ? In July they should bend northwards over the land and southwards over the oceans. In



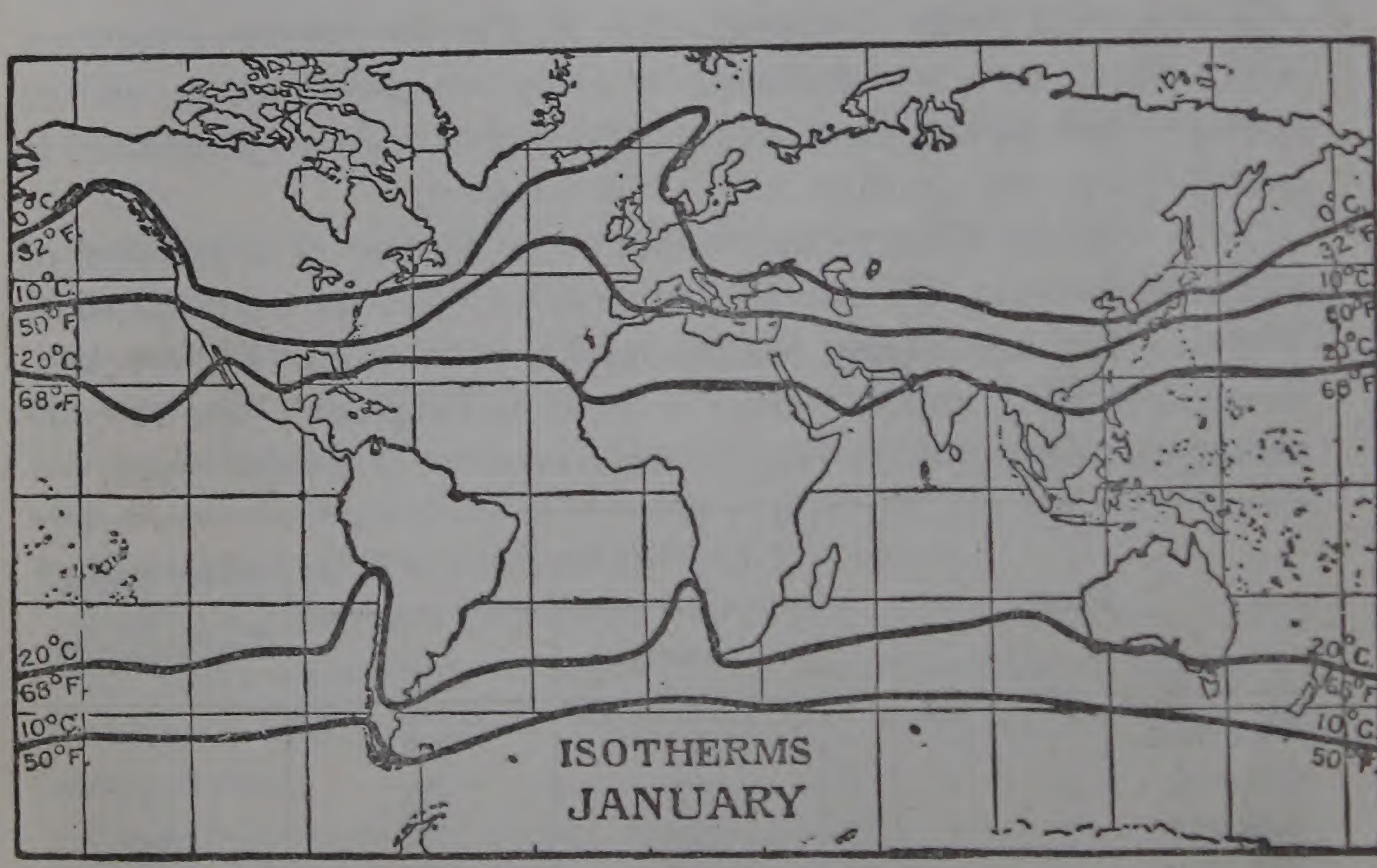


FIG. 20.—ISOTHERM MAPS OF THE WORLD.

January they should bend northwards over the oceans and southwards over the lands. Verify by reference to the map. The bends are not very regular; so there must be other influences at work. These we will mention later.

We should expect, then, that the middle of one of the land areas, North America or Eurasia, would have a hot summer and a cold winter. We should also expect places near the sea to be cooler in summer and warmer in winter than places far from the coast. Let us see if this is so.

There are two towns near the Indus which we may consider. One is Karachi, on the coast, the other is Jacobabad, near the northern boundary of Sind. The mean monthly temperatures are highest in June and lowest in January at each place. They are:

	June.	January.
Karachi - -	87°	65°
Jacobabad - -	98°	57°

The annual range of temperature, that is the difference between the highest and lowest mean monthly temperatures, is 22° at Karachi and 41° at Jacobabad. The wide range at Jacobabad is partly due to the nearness of the Thar Desert.

As a further illustration, examine the figures of a number of places in Eurasia, all situated between 51° and 52° north latitude. The first two are seaside places, one being an island at the southwest of Ireland, and the other a town in Belgium. The rest are arranged in order according to their distance from the coast.

Place.	Mean Monthly Temperature.		Mean Range of Temperature.
	January.	July.	
Valentia - - -	45	57	12
Ostend - - -	38	63	25
Leipzig - - -	30	64	34
Breslau - - -	28	65	37
Warsaw - - -	24	66	42
Kursk - - - -	14	67	53
Orenburg - - -	4	71	67

It will be observed that, proceeding from the coast to the middle of the continent, the winter is colder and colder, the summer hotter and hotter. Valentia has a **maritime climate**—a sea-side climate. Because the winter and summer temperatures are almost equal, its climate might be described as *equable*. Orenburg has an **extreme or continental climate.** Its temperature ranges from one extreme to the other.

Wind plays an important part in making the climate of sea-side places equable. It is the means by which warm air is carried from the ocean to the shores of the continent.

As examples of other places with equable climate, we may mention Colombo, with a range of 3° (79° to 82°); Bombay, with a range of 10° (74° to 84°); and Rangoon, with a range of 10° (75° to 85°). The climate of these three towns is *equable but hot*; that of Valentia is *equable but cool*.

We must not omit to mention Verkhoyansk. This Siberian town is situated within the Arctic Circle. It has a colder winter than any other inhabited place. It is also distinguished as having a greater range of temperature than any other place in the world. The mean January temperature is −59°; the July temperature is 59°. Thus Verkhoyansk has the remarkable range of 118°.

Movements of the ocean waters also affect climate. They help to produce the bends in the isotherms mentioned above. We shall deal with ocean currents in the chapter on the sea. But two of them may be specially mentioned now. One is the North Atlantic Drift. It flows in a north-east direction, towards the western shores of Europe. The other is the North Pacific Drift. This also flows north-east, towards the western shores of Canada.

Both these currents flow from warmer to colder regions. They carry warm waters northward. Thus they raise the temperature of northern seas. Their effect is most noticed in winter, when the lands are cold.

The influence of the North Atlantic Drift is seen on comparing the temperatures of two towns. Bergen on the west coast of Norway has a January temperature of 34°. Riga, on the Baltic Sea, has a January temperature of 23°. Bergen benefits from the warm current; Riga is shut off from its influence.

Vegetation has an equalising effect upon climate. It reduces the amount of heat absorbed by the land during daytime or in hot weather. It also prevents heat from being radiated into the air from the land at night and during cool weather. Desert regions have great ranges in temperature from day to night and from summer to winter.

EXERCISES

1. What is meant by "extreme climate"? Mention two places which have such a climate and give an explanation.

2. The average temperatures for the months of June and January of Calcutta, Multan and Darjeeling are given below:

Town.	Mean Temperature, June.	Mean Temperature, January.
A - - -	60	40
B - - -	85	65
C - - -	95	56

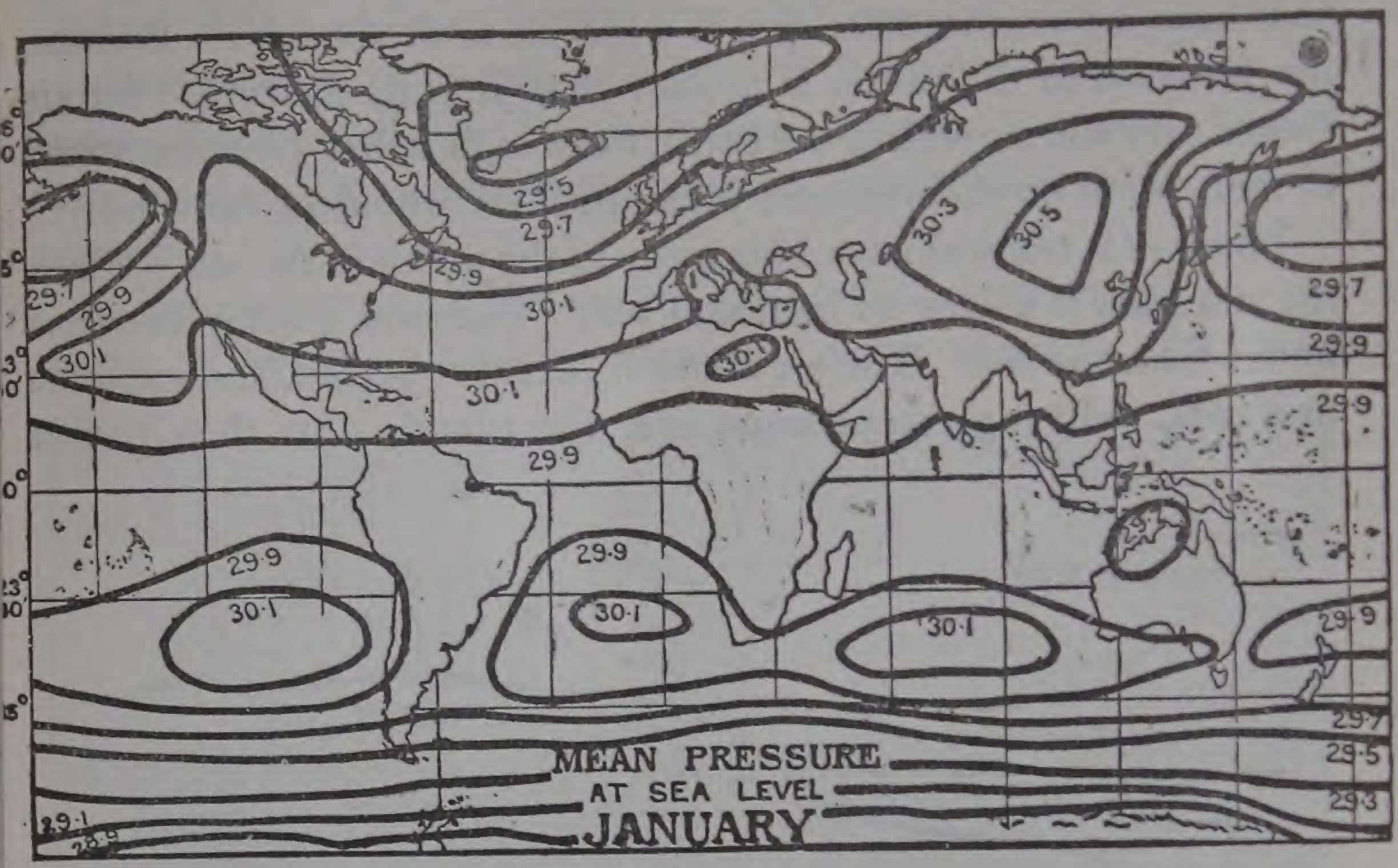
State which towns the letters *A*, *B*, *C* represent, and give reasons for your answer.

VII. WINDS AND RAIN

The atmosphere is a mixture of gases. The chief gases it contains are nitrogen and oxygen—in the ratio 4 to 1. Smaller quantities of carbon dioxide and water vapour are present. Water vapour is continually passing into the atmosphere from all surfaces of water.

The atmosphere envelops the earth. It is supposed to extend upwards for about 200 miles. It gradually "thins out," that is becomes more rarefied as altitude increases. At sea-level the atmosphere exerts a pressure of 14¾ lbs. per square inch. This is equal to the weight of a column of mercury 29·9 inches high and one square inch in section. At an altitude of 16,500 feet the pressure is 15 inches. Breathing is difficult at great altitudes. This explains the failure of expeditions to reach the summit of Mt. Everest.

At the surface of the earth pressure varies from many causes. Amongst them are differences in temperature, movements of air, presence of water-vapour, and rotation of the earth.



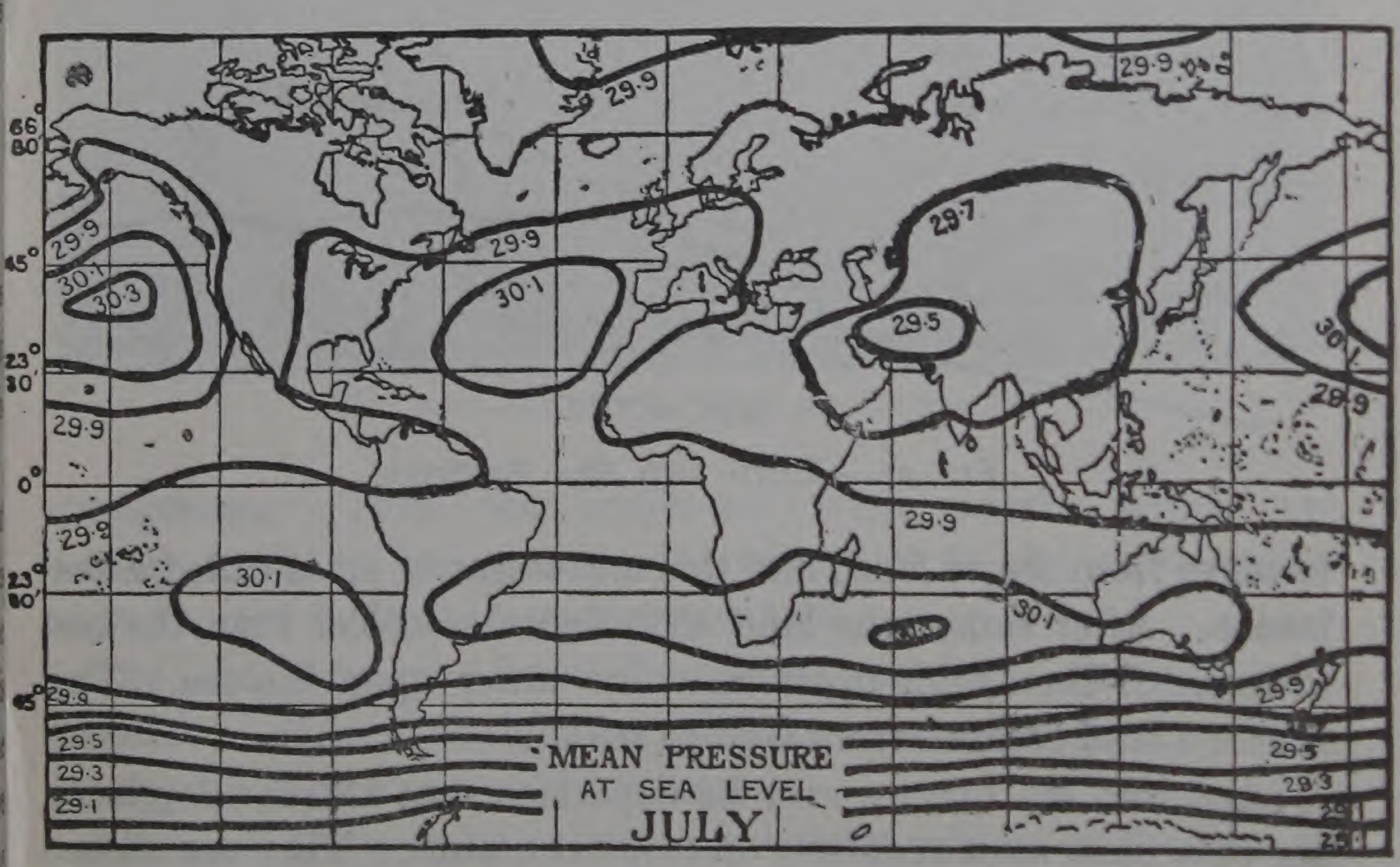


FIG. 21.—THE WORLD: JANUARY AND JULY PRESSURE BELTS.

Winds are the result of differences in pressure. Why does air pass from a pump into the tyre of a bicycle or motor-car? Because the pressure in the pump is greater than it is in the tyre. So air moves over the surface of the earth, from high to low pressure areas. If there were no difference in pressure there would be no wind.

Think of a tropical island far away in the midst of the sea. When the sun rises it shines on land and sea. The land quickly becomes hotter than the sea. The air above it becomes heated, and expands upwards, reducing the pressure over the island. Air then begins

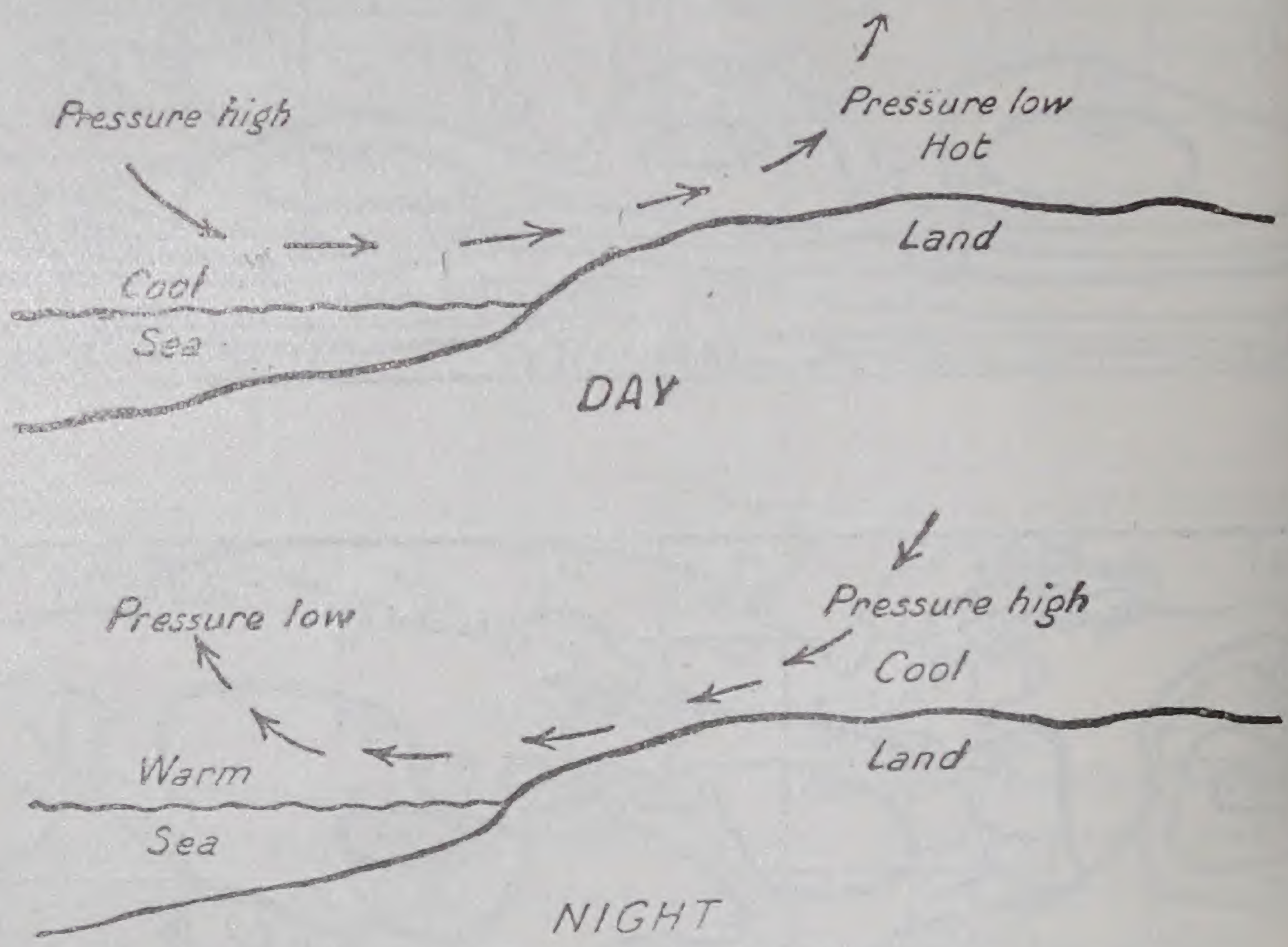


FIG. 22.—LAND AND SEA BREEZES.

to move from sea to land, and this movement of air is called a **sea-breeze.** After sunset the land soon becomes cooler than the sea. Pressure is then high upon land and lower upon the sea. This causes a **land breeze**—from land to sea.

Land and sea breezes may be experienced at all seaside places, but they blow most regularly on tropical islands. They are classed as **periodic winds** because they prevail for certain periods.

The **monsoons** of India and S.E. Asia are periodic winds. They might be described as land and sea breezes on a grand scale, blowing for periods of about six months. When the sun is advancing from

the equator to the tropic of Cancer, the land area—India and Central Asia—becomes hotter than the sea. A low pressure is established over the land, and the air begins moving from the Indian Ocean and the Pacific Ocean towards the land. India thus receives the **south-west monsoon**, and China a south-east monsoon.

In the early part of the season (May) the monsoon is not very strong. As the "low" becomes more marked the wind

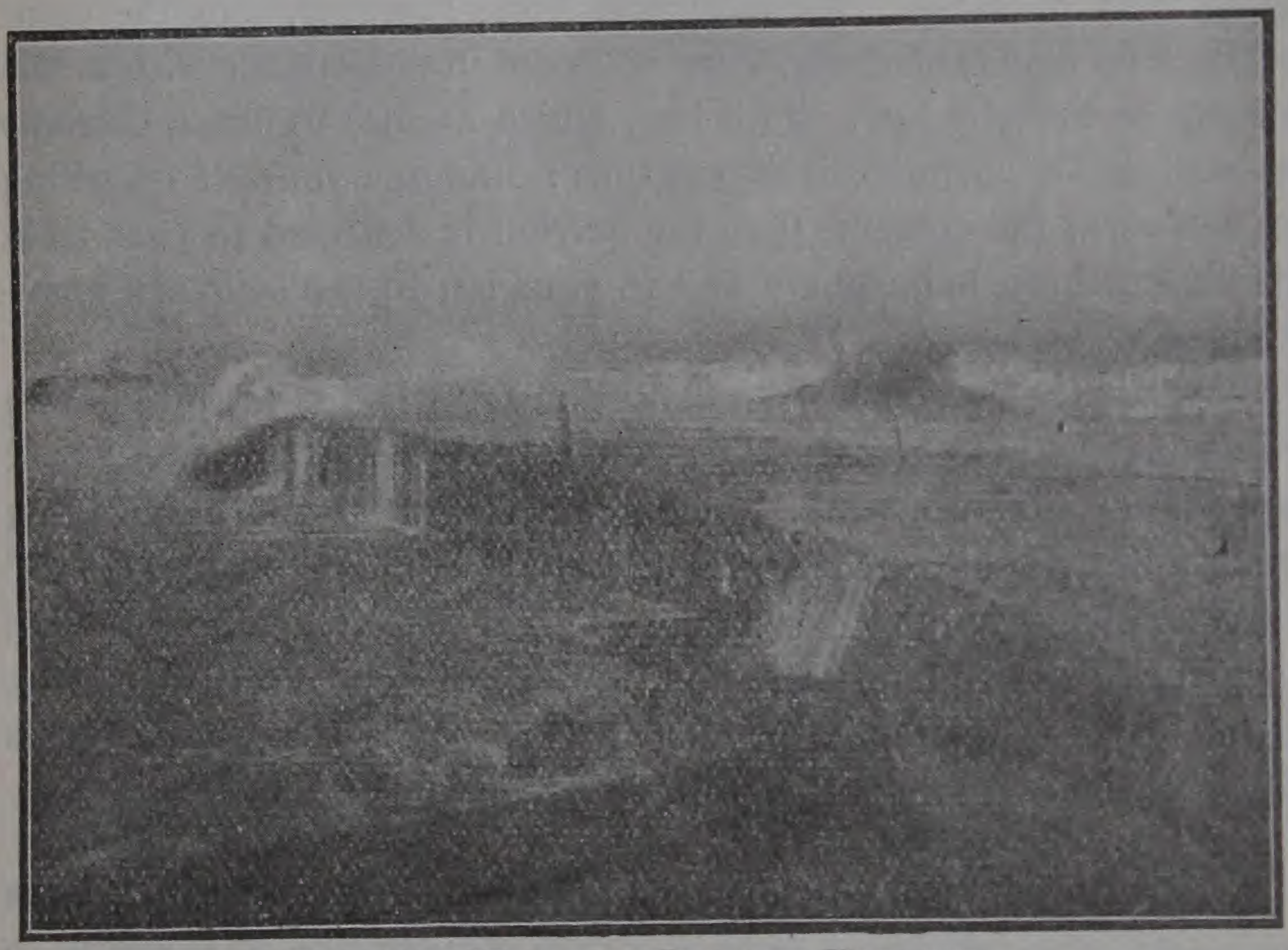


FIG. 23.—MONSOON SEAS AT KARACHI.

strengthens. Then the south-east trade winds, which are usually south of the equator, are sucked in to the wind system of India, and in June the **monsoon bursts.**

The air, brought from the ocean, is fully charged with moisture. Heavy downpours of rain occur in many places, accompanied by thunder and lightning.

The monsoon usually continues to about middle of September, when the sun has retreated south to the equator. Then increase of pressure takes place over the cooling land. This is followed by movement of air from land to sea—the **north-east monsoon.** This is, of course, a dry land wind.

Australia occupies a position in the southern hemisphere, corresponding to that of India in the north; that is, Australia lies south of a great tropical sea as India lies north of one (see Fig. 25). Thus Northern Australia has a wet monsoon during the period of the dry monsoon in India. Other regions where monsoons prevail are north-eastern Africa (Abyssinia), and the western side of Mexico where the land bulges out into the Pacific.

We shall refer to the monsoons again when dealing with the geography of India. We may note here, however, that the monsoons, and also other winds, are deflected in accordance with a rule known as **Ferrel's law.** This law, which applies to ocean currents as well as air currents, is stated thus: imagine yourself travelling *in and with* the current, then the current is deflected to your right in the northern hemisphere and to your left in the southern hemisphere.

What is the reason for the deflection? It is due to the rotation of the earth. On a motionless globe, India's wet monsoon would appear as a south wind. Points on the equator are travelling 1000 miles per hour from west to east; but points on parallel 35° travel only 850 miles per hour. The monsoon acquires a high velocity in the equatorial region, and approaching a slow-moving belt of the earth, tends to outstrip it; that is the wind swerves towards the east and is therefore experienced as a south-west wind.

Monsoon regions are of a special kind with winds caused by great reversals of pressure. Let us note the distribution of pressure in the world generally (see Fig. 21).

(1) There is an **equatorial belt of low pressure.** This is what one would expect in the hot region of the earth, where the heated air is constantly ascending. The ascending air forms two currents high above the surface of the earth; one goes northwards and the other southwards. Becoming cool and heavy, they descend in latitudes 25° to 35°, thus increasing the pressure there. The pressure in this region is further increased by air which the spinning earth appears to fling off regions nearer the poles. Hence we have (2) a belt of high pressure near the tropic of Cancer, and (3) a belt of high pressure near the tropic of Capricorn. These are the **sub-tropical high pressure belts.**

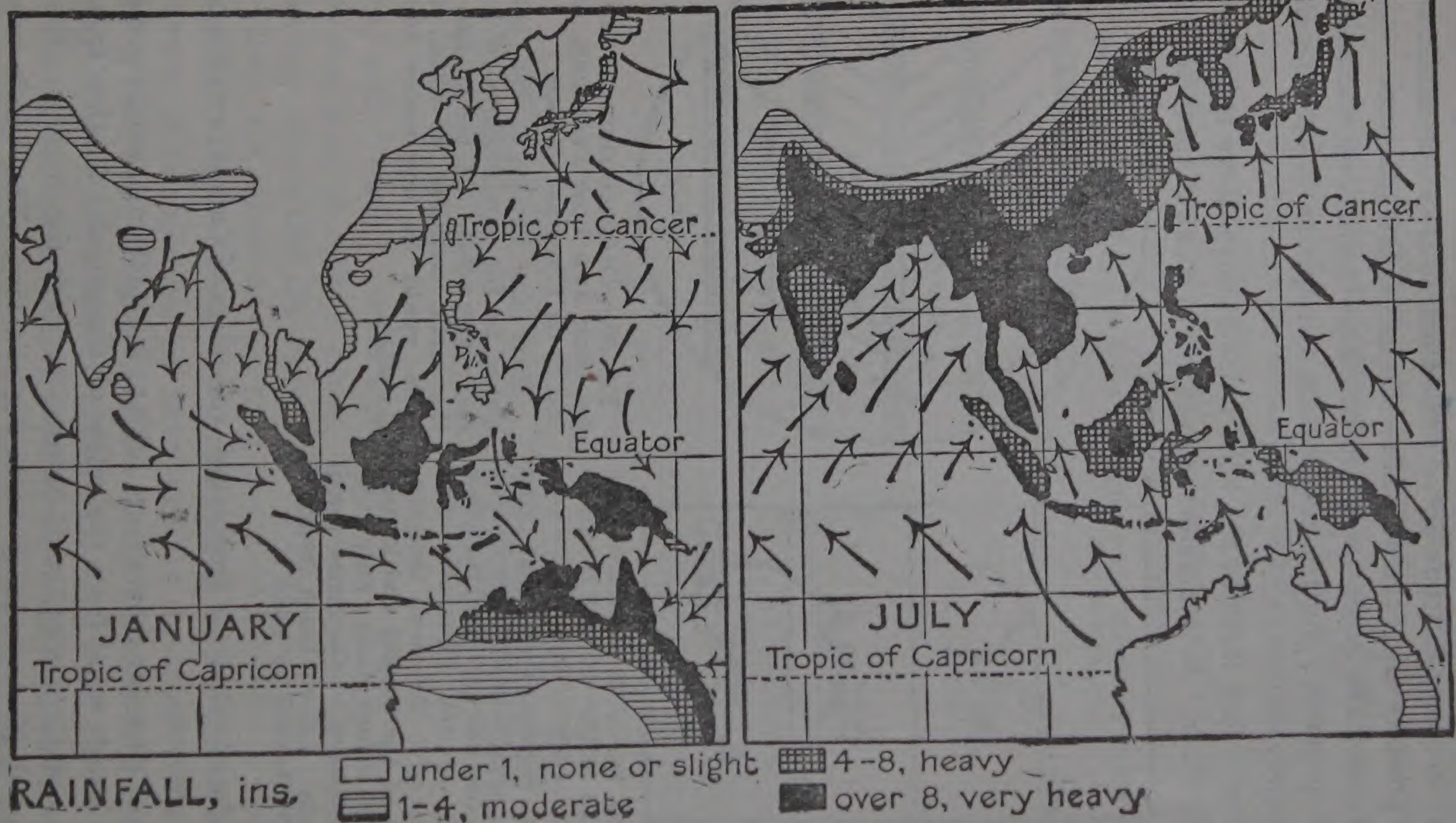


FIG. 24.—MONSOON DIAGRAMS.

The regions from which the air is flung will be low pressure belts. They are near latitude 60°. Thus there is (4) a **sub-Arctic belt of low pressure** and (5) **a sub-Antarctic belt of low pressure.**

Around the poles there are probably regions of comparatively high pressure; further exploration is required before this can be definitely stated.

In the first three of the belts named above, there is little movement of air. It is therefore convenient to speak of these belts as the

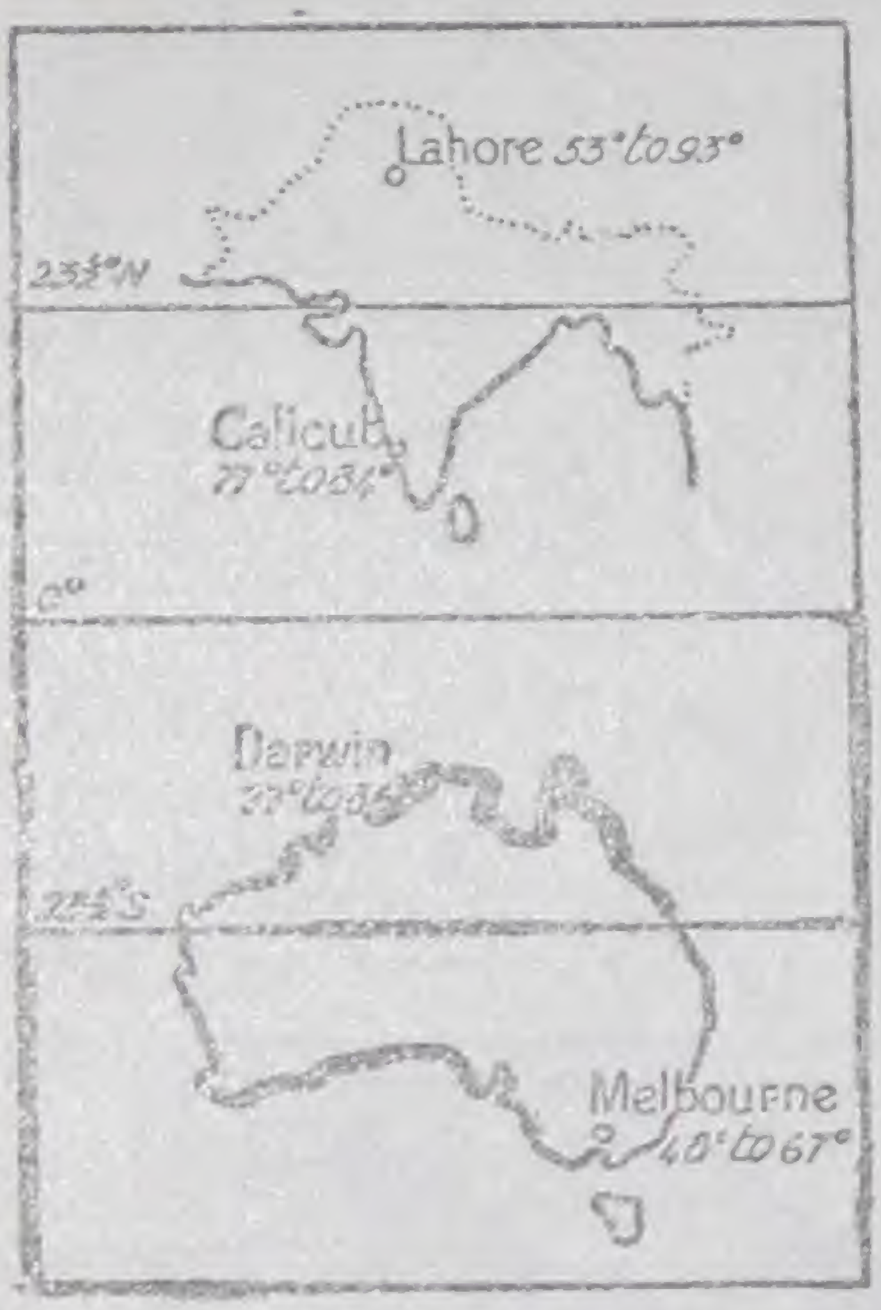


FIG. 25.—THE POSITION AUSTRALIA WOULD OCCUPY IF MOVED ABOUT 4,000 MILES WESTWARD.

The diagram shows that India and Australia lie in corresponding latitudes, one north and the other south of the Equator. The figures give the mean temperatures of the coldest and hottest months at four places; they show the influence of the ocean upon climate. Lahore has a range of 40°, Melbourne 19° only.

FIG. 26.—DIAGRAM SHOWING BELTS OF HIGH AND LOW PRESSURE, AND BELTS OF CONSTANT WINDS.

There are breaks in the belts, owing to the intermixture of land and water areas. If the surface of the earth consisted of water, the belts would be continuous round the world.

equatorial calms (or Doldrums), the calms of Cancer, and the calms of Capricorn.

Now since air moves from high to low pressure areas, there must be a steady wind from the calms of Cancer and another from the calms of Capricorn, each blowing towards the equator. Each is deflected in accordance with Ferrel's law. The winds are the north-east trade and the south-east trade.

There will also be winds from the high pressure calms towards the sub-Arctic and sub-Antarctic lows, also obeying Ferrel's law. These are the **westerly winds**, or simply **westerlies**. In the southern hemisphere, where there are few land areas to interfere with pressure distribution, the westerlies are very steady and strong. For this reason they are known as the **Brave West Winds**, and the latitudes they blow over are the "Roaring Forties." (Refer to Fig. 26.)

The "trades" and "westerlies" belong to the class of **constant winds.** Curiously enough, the westerlies are often described as the *variable westerlies*. This is because they vary more in force and direction than do the trades.

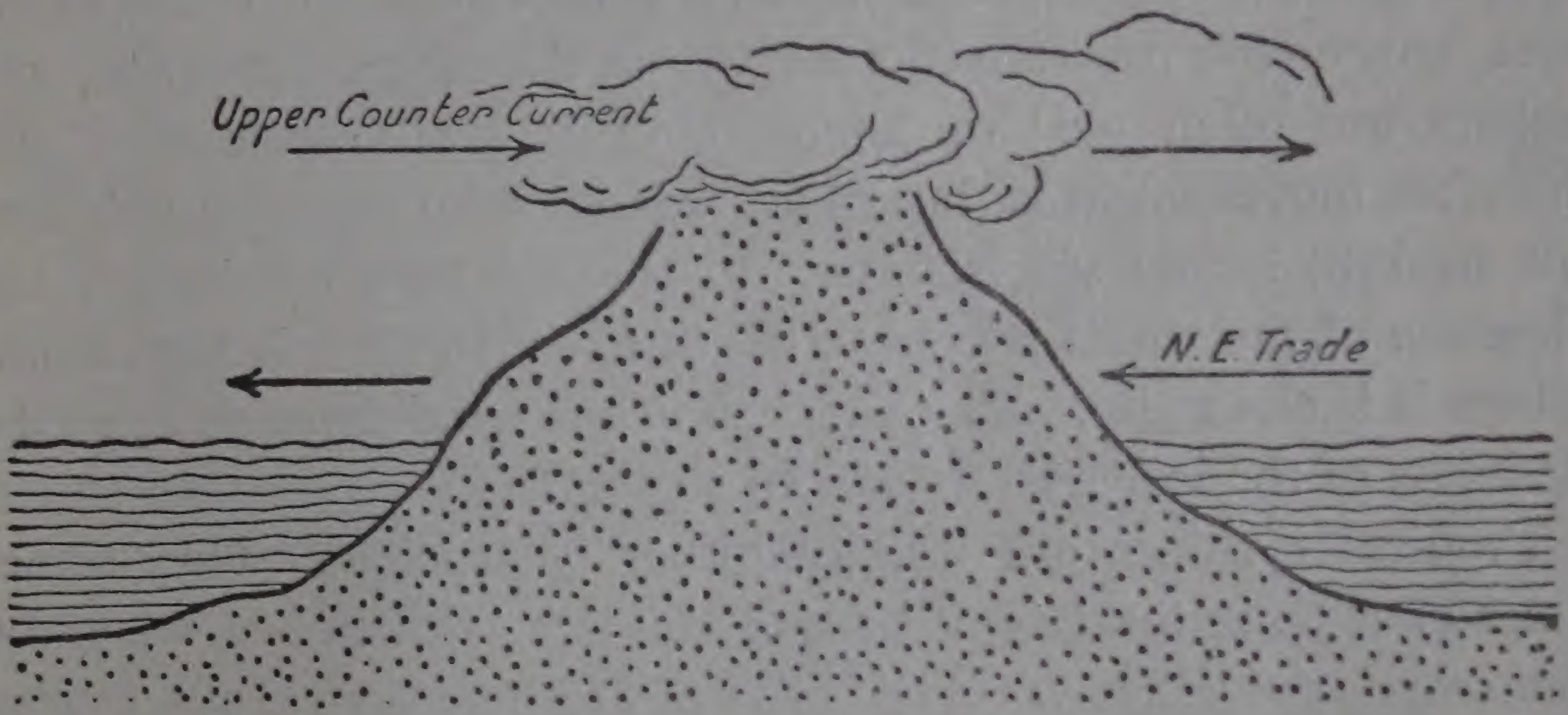


FIG. 27.

Teneriffe (Canary Islands) is situated in the Trade Wind belt. Whilst the wind near sea-level is blowing from the north-east, clouds are often seen at a high level, approaching the summit of the mountain from the south-west.

The term "trade" comes from "track." Track winds are those that keep to a fixed track. Observations in the Atlantic Ocean have shown that the trades are very steady. They maintain their force and direction—allowing for deflection—for a run of 2000 miles. The mean velocity for the year of the north-east trade was found to be $10\frac{1}{2}$ miles per hour, and for the south-east trade 14 miles per hour. High above the trades are counter currents, blowing in the opposite direction (Fig. 27).

As the sun travels northwards and southwards, the **heat equator** or line joining places which have highest temperature also moves. Consequently, *the belts of calms and constant winds shift a few*

degrees northwards during the northern summer, and a few degrees southward during the southern summer.

Cyclones are regions of low pressure of a kind quite different from the low pressure belts already mentioned. They are wind systems that *travel*, and in the Atlantic and Pacific Oceans their track is often roughly the same as that of the westerlies. All the causes of their origin are not known; but in many cases they are the result of the meeting of warm with cold air currents. Weather officials examine cyclones most carefully, and by noting their movements are able to forecast weather in the lands the cyclones are approaching.

In a cyclone, or "depression" as it is now generally called in the west, barometric pressure increases from the centre outwards; the isobars are often oval or almost circular, and concentric. Air therefore moves inwards, but in accordance with Buys Ballot's law, not straight across the isobars. In the northern hemisphere the direction of the winds is counter-clockwise; in the southern hemisphere it is clockwise. The strength of the wind depends upon the closeness of the isobars. (Refer to Fig. 17.)

Tropical cyclones are usually rather destructive. They sometimes develop in the Bay of Bengal and the Arabian Sea, when the monsoon is dying away. The coasts of Madras, Bengal and Burma have suffered great damage from cyclones. Their usual track is towards N.E., near the head of the Bay, but they sometimes travel across India—most commonly along the Ganges valley or through Madras.

The East Indies and the West Indies are two other regions where destructive storms of the cyclone type are common. Described as *typhoon* in the East Indies and as *hurricane* in the West Indies, the storm originates in the ocean, to the east of the islands. Its course is usually westerly in each region; but sometimes the East Indies storm bends away along the course of the Kuro Siwo current, and travels as far as Japan.

Anticyclones are high pressure systems, and the winds blow outwards from the centre. The direction of the winds is clockwise in the northern hemisphere and counter-clockwise in the southern hemisphere—just opposite to the cyclonic winds.

Winds do very important work as rain-bringers. Let us see how

FIG. 28.—THE WORLD, ANNUAL MEAN RAINFALL.

this takes place. If you leave a dish of water in a room, the water gradually disappears. It passes into the atmosphere in the form of an invisible gas called *water-vapour*. At the surface of every ocean, lake and river this same process, called **evaporation**, is quietly going on day by day.

The capacity of air for water-vapour depends upon its temperature. At 50° F. air will take up twice as much, and at 75° F. four times as much water-vapour as air at 32° F. A fall of temperature will therefore reduce the capacity of air for water-vapour. Hence when saturated air is cooled some of the water-vapour it contains is **condensed**, that is, it passes into the liquid state. During the night, when plants have become cool by radiating into the atmosphere the heat they acquired during the day, moisture from the air is often deposited on leaves and flowers in the form of **dew**—or, if the temperature is below freezing-point, as hoar frost.

When a man draws smoke into his mouth from a cigarette, each particle receives a deposit of moisture. The smoke when puffed out again has a whitish cloud-like appearance, quite different from the smoke which rises from the burning end of the cigarette.

In the same way, water-vapour in the atmosphere condenses upon floating particles of dust. Myriads of these massed together form a **cloud**; a cloud that is low down near the earth's surface is called fog or mist. Further condensation causes the particles of water in a cloud to coalesce into drops. These, if too heavy to float, fall as **rain**—or, if the temperature is below freezing-point, as snow.

What is the final step in rain-making? What is it that forces clouds to give up their load of moisture? When you use a pump to inflate the tyre of a bicycle, you notice that the barrel of the pump becomes warm; that is the result of compressing the air in the pump. Compressing a gas raises its temperature; then reducing the pressure and allowing it to expand should lower its temperature. This is actually true; in one kind of freezing machine, intense cold is produced by the expansion of a gas.

Thus *whilst air is expanding upwards, its temperature is falling*, and it is also passing into colder regions of the atmosphere.

We may therefore expect rain when winds carry clouds, or air loaded with water-vapour, to greater altitudes. There are three

important causes of this upward movement of air currents. Rains may therefore be described under three headings, which indicate their mode of origin.

(*a*) **Relief rains** are caused by the surface relief of the land. When wind meets a mountain system, or even a range of hills, the current is deflected upwards. Mountains such as the Western Ghats and the Canadian Rockies, which intercept ocean winds, have heavy rainfall on their windward slopes.

(*b*) **Convection rains** are caused by moisture-laden air being sucked into the " convection currents "—the ascending air currents —of highly heated regions. Rains of this type occur in the equatorial low pressure belt.

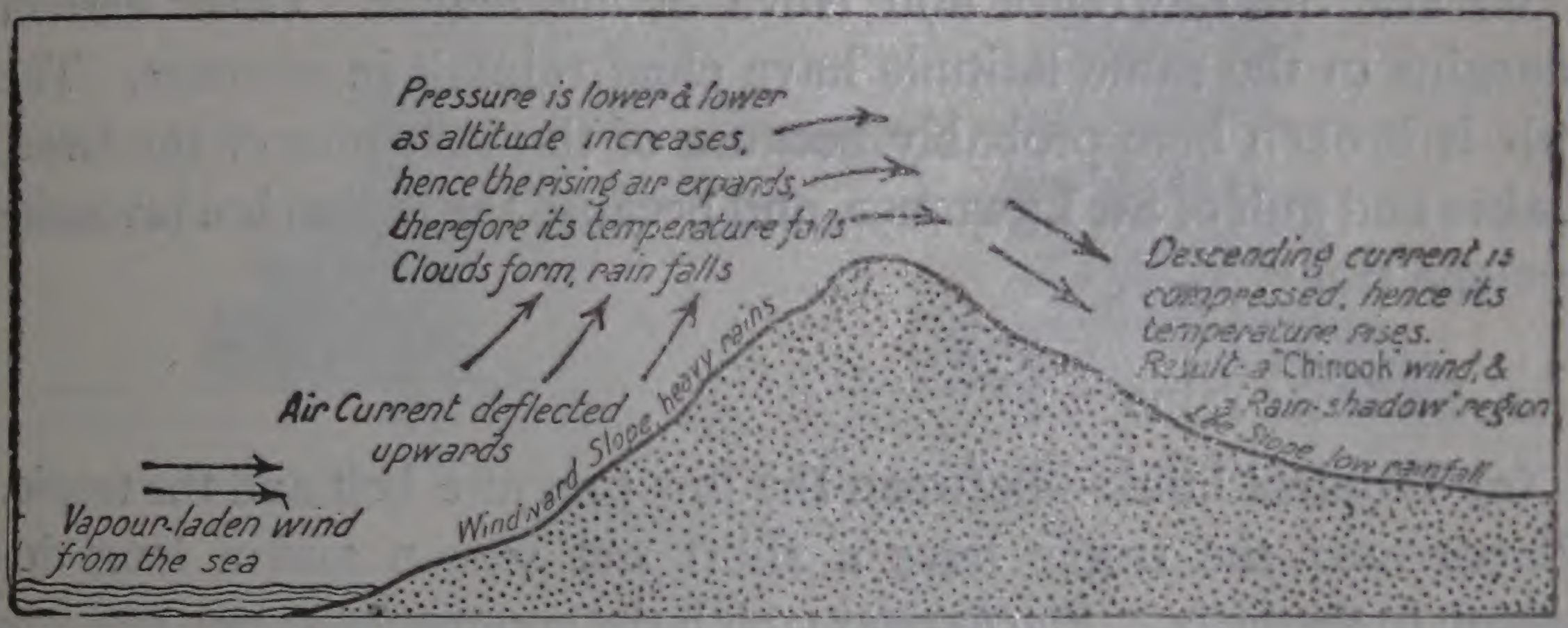


FIG. 29.—DESIGN TO EXPLAIN THE CAUSES OF RELIEF RAINS, CHINOOK WIND, AND RAIN-SHADOW REGION.

(*c*) **Cyclonic rains** are of course those associated with a cyclone. Low pressure exists at the centre of the system, where the air must therefore have an upward movement. The regions where cyclones are most common have already been mentioned ; but cyclonic rains are not restricted to those only.

Rainfall is distributed very unevenly over the earth's surface ; and the chief rains occur at different seasons in different places. Below is given a general scheme of seasonal rainfall. It is not possible to include all regions in such a scheme, one reason being that reliable information cannot be obtained from all places.

1. **Rainfall at all seasons**

(*a*) Equatorial low pressure belt, extending for a few degrees on each side of the equator. Heaviest rains occur near the times when

the sun is overhead. There are two very wet seasons, and two rather wet seasons in the year. Regions of this kind are the Amazon basin, Congo basin and Guinea coast, and the East Indies.

(*b*) Western margins of continents in the cool temperate zones. These lie in the track of the westerlies, which bring vapour-laden air from the oceans at all times. In addition, "depressions"—most important rain-bringers—are to be expected at any part of the year. Still, more rain falls in autumn and winter than in the other half of the year. Typical regions are the British Isles and N.W. Europe, the northern portion of the western margin of North America, southern Chile, and a large part of the western side of New Zealand.

(*c*) The St. Lawrence and Nova Scotia region. Other eastern margins in the same latitude have chief rainfall in summer. The rule is broken here probably because of the influence of the Great Lakes and gulf of St. Lawrence, and because the region is a favourite cyclone track.

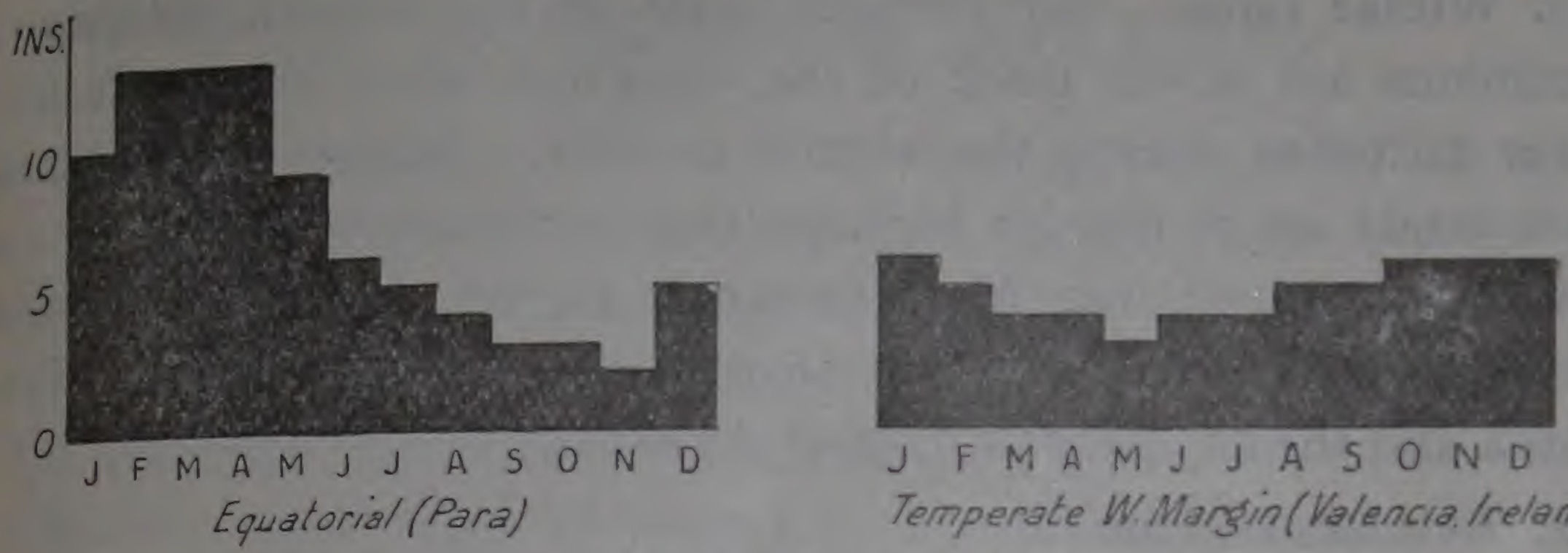
2. Summer rains

(*a*) Tropical lands—between the low pressure belt and the tropic. Places near the tropic have a short wet season and a long dry season in the year. Places over which the sun passes at two separate times, have two wet seasons (near the time when sun is overhead) and two dry seasons each year. Such places are between 5° and about 15°, north or south.

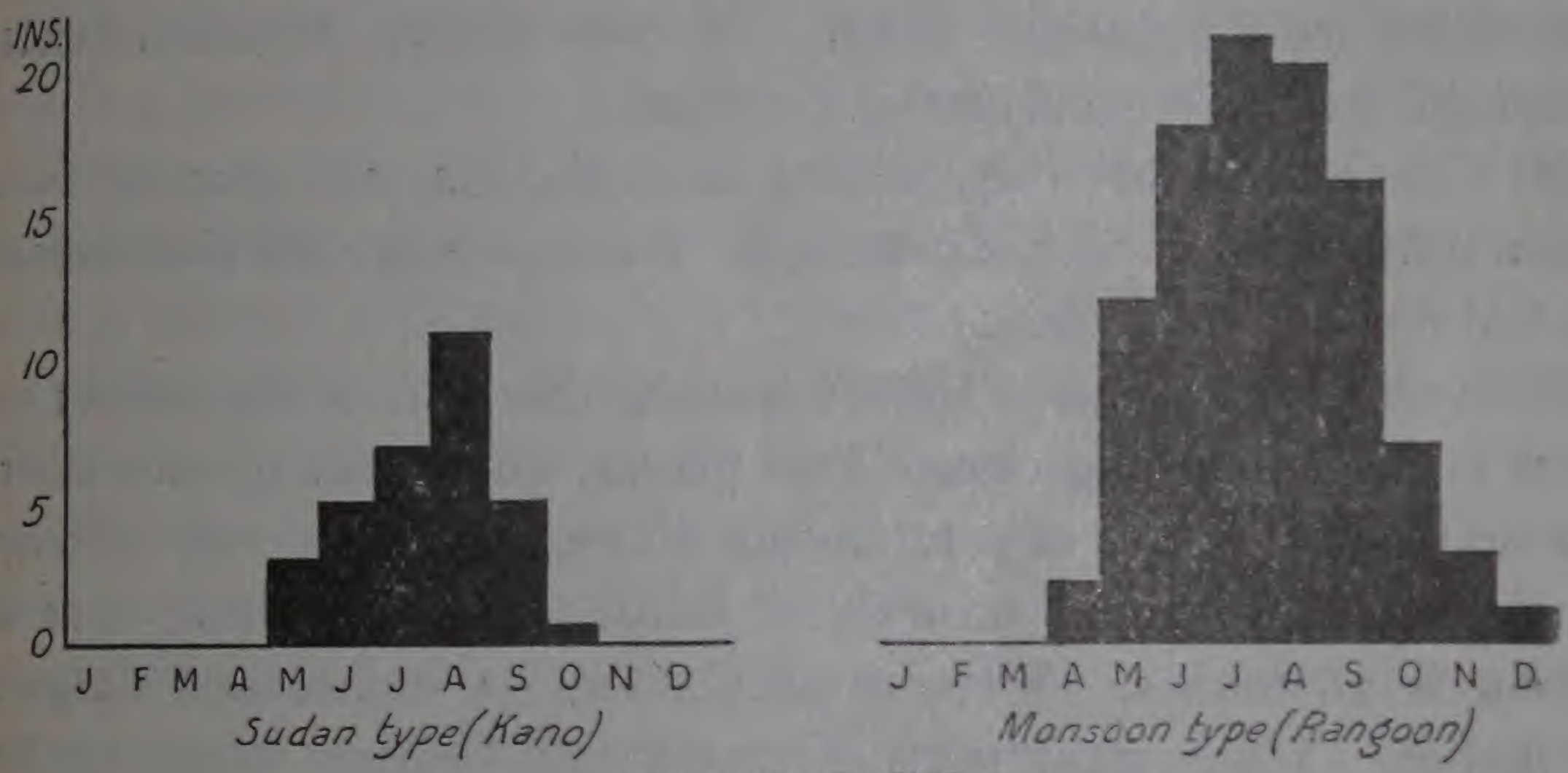
(*b*) Monsoon lands, generally, have a hot wet season and a cool dry season, due to reversal of the winds. Examples are India, South-east Asia, China, Northern Australia, North-east Africa, and Western Mexico.

(*c*) Eastern margins of continents in temperate zones, such as Eastern Siberia, Eastern Queensland, Natal, Uruguay, and part of the eastern margin of the United States of America.

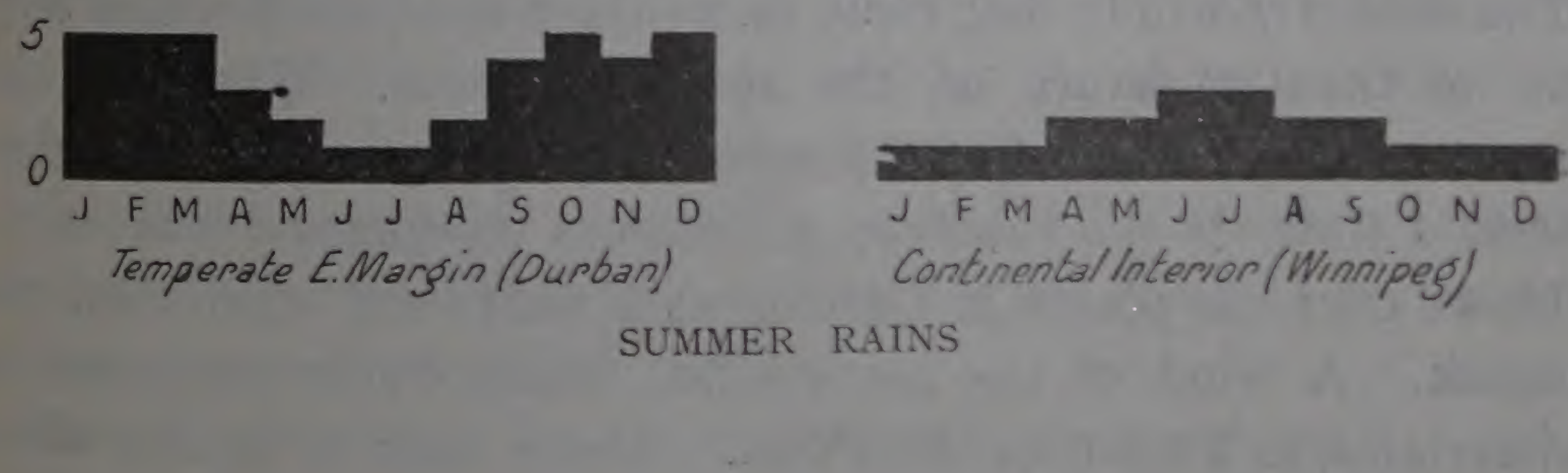
(*d*) Continental interiors in temperate latitudes, if not too far from the sea. Rainfall is not so heavy, nor so well marked as in the preceding three. The ground becomes very hot in summer, whilst the air overhead is still cold; the result is heavy showers. Regions of this type are the Steppes of Russia, the prairies of North America.



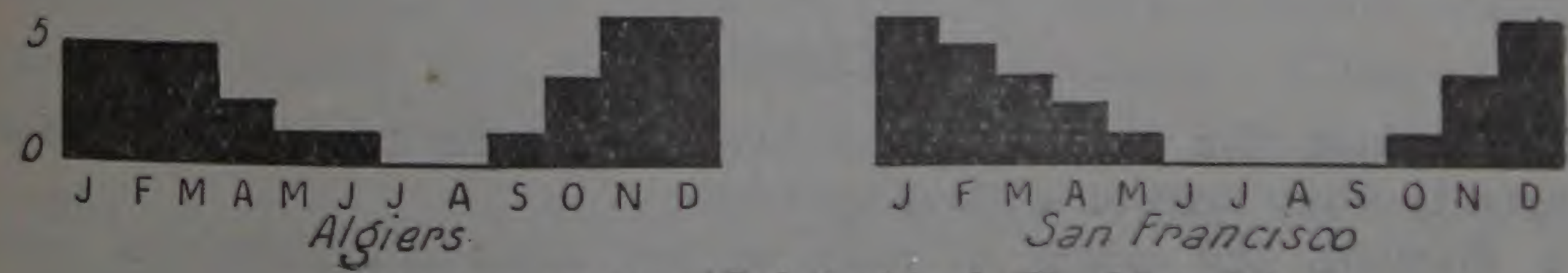
RAIN AT ALL SEASONS



SUMMER RAINS



SUMMER RAINS



WINTER RAINS (*Sub-tropical W. Margin*)

FIG 30.—TYPES OF RAINFALL.

3. **Winter rains.** Sub-tropical lands on the western margins of continents are in the track of the westerlies when they shift into lower latitudes during the winter months. During the summer these lands are in the dry high pressure, or trade wind belt.

Examples are: the Mediterranean region, California, central Chile, Cape Town district, south-west of Western Australia, Tasmania and the adjacent portion of Australia.

4. Rainless regions

(*a*) Western margins of continents in the high pressure belts. Examples are the Sahara desert, Colorado desert, Atacama desert, Kalahari desert, West Australian desert.

(*b*) Continental interiors, remote from the sea, and shut off from ocean influences by high mountains. Examples are the Gobi desert, central desert of Australia.

Rain shadow regions. Before leaving this part of the subject we must notice something else. Two places, quite near to each other, but on opposite sides of a mountain ridge, may have very different rainfalls. The annual rainfall of Bombay is 74 inches; that of Poona is 26 inches. Victoria (B.C.) has 31 inches and Calgary 16 inches. When mountains intercept rain-bearing winds, the lee side must of course have less rain than the windward side. It is as if places on the lee side were shielded from heavy rain; hence the use of the term "rain-shadow" (see Fig. 29).

The westerly winds that blow on to the Canadian Rockies, drop most of their moisture on the seaward slopes. When the air-current reaches the level of the mountain tops it is dry. If it then descends towards the interior, it becomes compressed and warm. It blows over the plains of Canada as a warm dry wind called the **Chinook.** A wind of the same kind, which blows sometimes in Switzerland, is known as the **Föhn.** There must be similar winds on the lee side of high mountains in many other places.

EXERCISES

1. Explain the terms: land breeze, sea breeze, and monsoon. Illustrate your answer with diagrams.
2. Explain the origin of rain, saying what circumstances cause rain to fall.
3. Name regions which have (*a*) summer rains, (*b*) winter rains, (*c*) rains at all seasons. Give reasons in each case.

VIII. THE MAKING OF LAND FORMS

Nobody knows how the earth came into existence. It may once have been as hot as the sun; it may in time become as cold as the moon. When shafts are sunk in the earth to reach coal, it is found that the interior is hotter than the surface. The first few feet of earth are affected by the sun's heat. After this outer layer is passed, temperature rises at the rate of about 1° F. per 60 feet.

Many people believe that the earth was once so hot that it was in a molten state. The outer layer became cool and hard, whilst the interior was hot and molten. The outer layer was therefore called the **crust of the earth.** The heavy material such as metallic ore would sink towards the centre.

It is therefore believed that the earth has a central core of iron. The crust is composed mainly of stony material, but it contains some of the metallic ore. Where the crust meets the iron core, stony matter and metals will be mingled.

Around the earth is an atmosphere. This must once have consisted largely of water-vapour. Enormous quantities of water-vapour would condense into water and fall upon the earth.

As the earth cooled, its surface became very uneven. Huge hollows or troughs were formed. The waters gathered in the troughs to form **oceans**; the high masses formed **continents.** The deepest place in the ocean, south-east of Japan, measures 32,600 feet; the highest mountain, Everest, is 29,141 feet.

The earth's surface is 197 million square miles in extent; of this 140 million sq. miles is water surface. Thus there is $2\frac{1}{2}$ times as much water surface as land surface.

There is an ocean, the Arctic, around the north pole; and a continent, the Antarctic, around the south pole. But the northern hemisphere is mainly land. Only the narrow parts of South America and Africa extend into the southern hemisphere. Thus, except for Australia, the southern hemisphere is mainly water. Between parallel 50° S. and the Antarctic Circle, water stretches unbroken round the world (Fig. 31).

For countless ages, whilst the earth was revolving round the sun, changes were taking place upon its surface. Heavy rains would

fall upon it. Mighty rivers would rush over the land, cutting their valleys deeper year by year. The **sediment** or rock waste so removed was swept along by the water. Some of it was used in building **plains**, on each side of the river ; some would drop to the bottom of lakes.

Much sediment was carried to the sea. There it was laid down, layer upon layer, along the shores of the continents. Water animals lived their life and died. Their remains fell to the bottom of lake or sea. They were buried in the accumulating sediment and, in time, fossilised. Pressure and natural cement, such as lime and silica, made the layers of sediment hard and solid. Thus were formed the

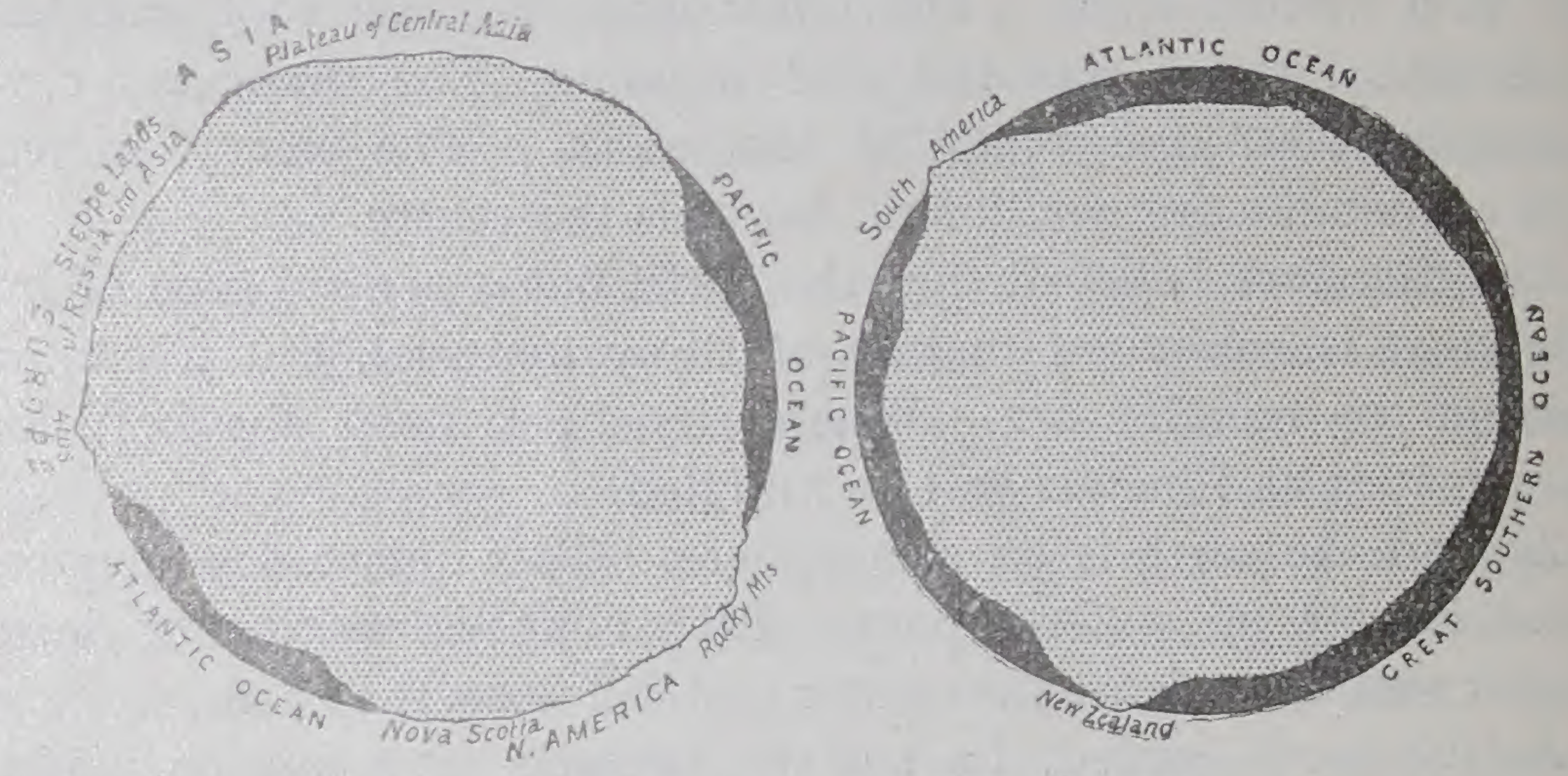


FIG. 31.—SECTIONS OF THE EARTH.

sedimentary rocks—the sandstones, limestones, clays, etc.—which form a large portion of the earth's crust.

Movements of the earth's crust raised the sedimentary rocks above the sea, to form new land areas. Rain and rivers at once began to wear them away. This process, the making of new rocks with wastage from the old, has been going on throughout the ages to the present day. Sediment is still being carried by the world's rivers to the sea. Plants and the remains of animals are still being buried in the sediments. The fossils found in sedimentary rocks, form a record of the life that existed upon the earth when the rocks were being formed. Human remains are found only in recent sediments, which have not had time to become solid rock.

When sedimentary rocks are examined, in a railway cutting or quarry, they are found in layers or **strata**.* In many cases the

* **Stratum** (singular number) = a layer or band. **Strata** is the plural form.

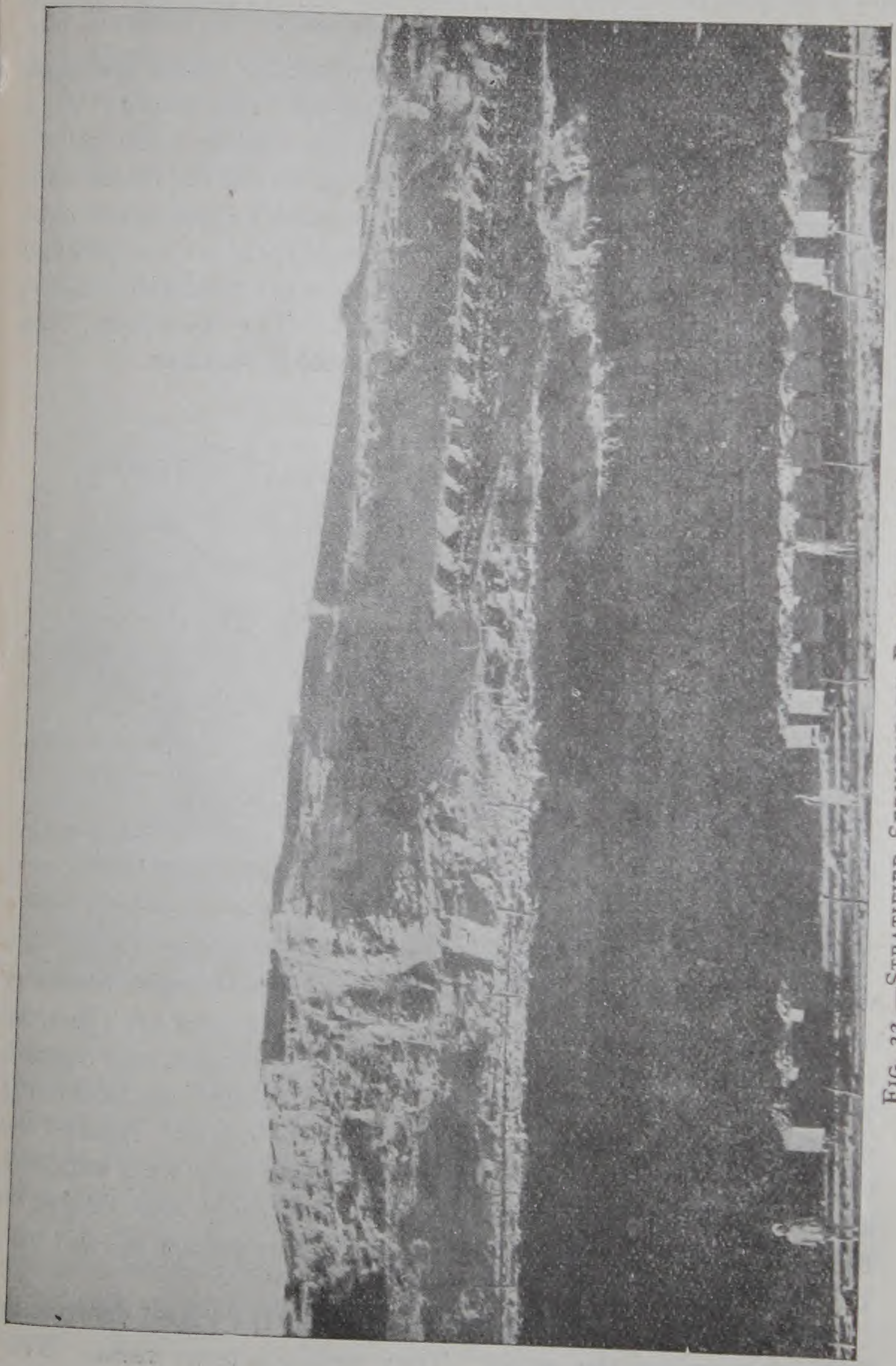


FIG. 32.—STRATIFIED SEDIMENTARY ROCKS IN AN INDIAN COLLIERY.

strata are bent into *upfolds* and *downfolds*, though they were formed in a horizontal position.

Hold a paper-backed book in your two hands. Press one hand towards the other and the book "buckles up" into a fold. Thus intense pressure, due to the contraction of the cooling earth, caused the crust to buckle up. We see evidence of that in the folded sedimentary rocks. The buckling up of the earth's crust made huge wrinkles or **folds** upon its surface. Some of these are on land and some on the ocean floor. The land wrinkles are **mountain ranges**; those below the sea are **submarine ridges.** The Himalayas, Tien Shan, Andes, Alps and other ranges are **fold mountains.**

FIG. 33.—CONTINENTAL WATER PARTINGS AND SUBMARINE RIDGES.

Most mountain ranges follow an irregular line. When the wrinkles were being formed, there were certain massive blocks of crust which now stand out as **plateaux.** Such plateaux are Tibet, the Pamirs, and Iran in Asia, Bohemia, the Black Forest, and Spanish Meseta in Europe. Many more will be noticed on examining physical maps and observing the bends of the ridges. Against the plateaux more yielding portions of the earth's crust were wrinkled, as you might wrinkle a table-cloth against a heavy book resting on the table. For this reason, mountain systems consist of—not one, but a *series* of folds.

The fold mountains form, in most cases, the grand **continental water-partings** of the world. They produce relief rains. They

divide the waters which fall upon the earth, shedding some in one direction and some in another. The result is that, with a few exceptions, all regions of the world are traversed by rivers.

During the wrinkling process, strata would sometimes break instead of bending. A long fracture was made in the earth's surface, and along this line there was a slippage of crust causing an

FIG. 34.—RIDGE DISSECTED BY RIVERS, KHANDALA, BOMBAY.

earthquake. Many thousands of earthquakes must have occurred during the uplift of the mountains. At the present day earthquakes are most common on the shorelands of the Pacific, and in a belt that stretches through the Mediterranean and Caucasus regions to Central Asia. They probably represent the final stages in the formation of the mountain ranges of these regions.

Records of past earthquakes can be seen in the sedimentary rocks. A stratum is found broken and dislocated, one portion

being some inches or feet below the level of the adjoining portion. Geologists call such a dislocation a **fault.**

Sometimes two or more fractures would take place along lines almost parallel. In such cases the block of crust between was either thrust upwards to form a plateau, or it subsided and formed a **rift valley.** The greatest rift valley in the world is one in which lie the river Jordan, the Dead Sea, the Red Sea, Lake Nyasa and other lakes of Central Africa. In some places the floor of this valley is actually more than a thousand feet below the level of the Mediterranean.

It is believed that even greater subsidences have taken place. A large block of land that once joined Africa, Asia and Australia subsided between gigantic fractures. Thus was formed the Indian Ocean, and India assumed its wedge-like shape.

Movements of the earth's crust determine **coastal configuration.** Examine a map of Asia showing depth of the seas. It will be observed that the Malay archipelago is separated from the mainland by shallow water. Also the mountaïn ridge of Sumatra can be traced through Java, Bali, Lombok and other islands. At one time this was an unbroken mountain range. A subsidence occurred. The low land was flooded by the sea. The higher parts remained unsubmerged; they rise above the sea as islands. More submerged mountain ranges can be seen in the **festoons of islands** along the eastern shores of the continent.

Islands formed by separation from a continent are suitably called **continental islands.** They resemble the mainland in structure (rocks), vegetation and animal life. Thus they are quite different from **oceanic islands.** These are formed in mid-ocean by volcanic action or by the labour of coral animals.

The British Isles are continental islands. Once they were joined to Europe by a plain. The plain was submerged; it is now covered by the North Sea. The submerged portion of a continent, covered by shallow water—to a depth of 600 feet—is called the **continental shelf.** The British Isles rise from the continental shelf of Europe, as the Malay islands do from the continental shelf of Asia.

Certain other features are well shown in the European regions. The west coasts of Scotland and Norway are very irregular, and they are fringed with islands. The indentations, called **fiords,**

extend for many miles inland. They are fractures in the edge of the Scottish and Norwegian plateaux. They filled with water when

FIG. 35.—THE CONTINENTAL SHELF.

the continental shelf was submerged. Many of these fractures had probably been widened by glaciers or rivers before the submergence

took place. In the south-west of Ireland there are good examples of rias, in Bantry Bay and Kenmare Bay. A ria is simply a valley that has been flooded by the sea.

Earth movements must cause weak places to develop in the crust. They also produce changes of pressure underground. A reduction of pressure lowers the melting point of a substance. Hence when the earth's crust buckles up, so reducing the pressure underneath, a quantity of hot solid rock will melt. Water may find its way through cracks deep into the hot earth. Being converted into steam it forces a passage to the surface, driving out the molten rock, and so causing a **volcanic eruption.**

The liquid rock issues white-hot from the vent or **crater.** It flows upon the earth as **lava.** Blocks of rock torn from the sides of the pipe are flung out. Great clouds of steam and sulphurous gas hang above the crater. Showers of fine ash, made from lava by the explosive action of steam, are scattered over a wide area. The glow of the hot lava within the crater is reflected by the clouds. This gives the *appearance* of fire; but a volcano is not a burning mountain.

The steam condenses into water, and falls as torrents of rain. The debris accumulates round the crater. Sometimes it forms a conical hill, or, after numerous eruptions, a mountain.

An eruption of Vesuvius buried the Italian cities Pompeii and Herculaneum over 1800 years ago. An eruption of Mont Pelée, on the island of Martinique (West Indies) destroyed the town of St. Pierre at the beginning of the present century. No less terrible was the eruption in Krakatoa, an island near Sumatra, in 1883, when an explosion completely shattered the island.

Volcanic eruptions leave a lasting mark upon the surface of the earth. The beds of lava cool into hard rock, differing altogether in appearance from sedimentary rocks because it is **crystalline.** The **minerals crystallise out** from the hot solution. It is called **igneous rock,** that is "Fire-rock." It was once believed that a volcanic eruption was the result of subterranean fire. But though there is intense heat there is not actual fire—except as an accidental circumstance—in a volcanic eruption.

Nowhere in the world is there a more impressive record of past volcanic action than in India. A large area in the Deccan, 200,000

square miles in extent, is built of layers of basalt. This is solidified lava. Eruptions at different times piled up one sheet of lava upon another, to a thickness in some places of over 4000 feet. A some-

FIG. 36.—A FIORD COAST (WEST OF SCOTLAND).

what similar outpouring of lava occurred in the Snake River region of America, and a smaller but similar one in the British Isles—north-east Ireland.

There are at least 300 active volcanoes in the world at the present

day. Most of them are on the **margin of ocean troughs**, or in ridges that rise from the ocean bed. Volcanoes are particularly numerous on the shore lands of the Pacific. There are at least 100 on each side of that great ocean.

A volcano is not necessarily a mountain, but in the Andes and Central America there are ten with an altitude of 10,000 feet. In North America there are many extinct volcanoes, but there are active ones in Alaska. The line is continued through the Kuriles, Japan, and other festoons of islands off the coast of Asia. Fifty are to be found in the Malay Archipelago, and others in New Guinea and New Zealand.

The great **submarine ridge** in the Atlantic, from which rise Tristan da Cunha, Ascension, St. Helena and the Azores, contains a line of thirty volcanoes active either now or in recent times. Far away to the north is Hecla in Iceland, whilst Erebus and Terror rise in striking contrast to the Antarctic icefields. Europe has volcanic districts in Etna (Sicily), Vesuvius and the Lipari Islands.

Granite is a well-known and useful igneous rock which should be specially mentioned. It is distinguished from basalt, partly in composition and partly by having larger crystals. The large crystals indicate that the rock cooled very slowly. This would be the case if it solidified without reaching the surface. Granite is therefore the result of activity underground. The hot molten rock would eat its way into the earth's crust without actually reaching the surface, and cooling slowly, under pressure, would form large crystals. There it remained until the removal of overlying rocks revealed its presence.

Some people believe that the first land upon the earth must have been composed of granite. Whether this was so, no one can definitely say. Granite does, however, form the core of most mountain ranges, and some granite masses *appear* to be older than any other known rocks.

Geysers and **hot springs** occur in some volcanic areas—in Iceland, New Zealand and the Yellowstone National Park of America. They appear to represent the closing stage of volcanic activity. A geyser is a fountain of hot water, issuing from a pipe which extends deep into the earth's crust. The water is hurled high into the air by the force of steam, formed low down in the pipe. Hot springs

are simply a quieter display of the effect of the earth's heat upon water. Both geysers and hot springs contain mineral matter in solution, and this is deposited around the hole from which the water issues.

EXERCISES

1. Explain the terms (*a*) sedimentary rock, (*b*) igneous rock. How could you distinguish one from the other ? In what parts of India is each to be found ?

2. What is the difference between a continental island and an oceanic island ? Explain the origin of each type.

3. Refer to the physical map of India in your atlas. Make a map showing what the country would be like if it sank 1500 feet. Where have such subsidences taken place ?

IX. THE SHAPING OF LAND FORMS

Land form is the name given to a unit of surface relief, such as hill, mountain, plateau, valley, lake-basin. The greater land forms were produced by the action of internal forces. These were described in the preceding chapter. The great land forms have been altered by such agents as rain, rivers, the sea, ice, frost and winds. At the same time new land forms were made.

When rain falls some of it sinks into the ground. It makes its way deeper and deeper, until stopped by some **impervious rock**, through which it cannot soak. The water then finds its way along the surface of the impervious layer. In time it reaches daylight again. It comes bubbling out of the ground, and we say there is **a spring**. If this happens in a desert, the spring water makes the small area round it an **oasis**. In many places underground waters have been reached by sinking a shaft from the surface. This is called an **artesian well**. Wells of this kind are common in many parts of India.

The **source** of a river is usually a spring, or a lake fed by springs. But in such regions as the Himalayas, many rivers "rise" in the melting ice of a glacier, as the Ganges and Jumna do From small beginnings rivers flow downward, growing as tributaries join them. The **basin** of a river includes all the land from which water flows to

join that river. The rim of high ground along the edge of the basin, dividing the rain that falls between one river and another is the **watershed.**

Rivers are most powerful shapers of land forms. When you see water flowing along a road on a wet day, you notice its muddy appearance. The mud consists of tiny particles washed off the surface of the road. Rivers do just the same kind of work. They carry away anything that is movable—particles of matter loosened by rain, and even fragments of rock. The swish of their waters against their banks eats away the land; this process is called **erosion** (=eating out). The sediment so removed is deposited lower down. It may be dropped on the bed of a lake, or on the bed of the river itself where the water is moving slowly. Much is deposited on the land beside the river during times of flood, some is carried down to the sea, and used in building sandbanks or deltas. Tests made in the Ganges show that this river removes 6,000,000,000 cubic feet of sediment from the upper part of its basin per year.

Rivers are therefore *constructive* as well as *destructive.* They destroy land forms but construct new ones. The two processes do not proceed at the same rate in all parts of a river's course.

The course of a typical river consists of three stages: (1) the Mountain stage, (2) the Valley stage, (3) the Plain stage. The three stages are not equal. In the case of the Ganges the first two are short and the third is very long. The Narbada has a long valley stage, but the other stages are short.

In the **mountain** stage river action is mainly destructive. The ground is steep and the current is swift. **Denudation**—the stripping off of the land surface—proceeds rapidly. The river leaps over rocky ledges in beautiful waterfalls, wearing away the rocks on which it drops. It roars over pebbles and boulders, rolling them against each other, knocking off their corners, tumbling them down-stream, and sweeping smaller particles for miles.

If the upper stage is on a plateau, the river will cut deeply into the land forming a **gorge.** Gorges are specially common in dry regions, where there is no "side-wash" from rain or small streams. They are also common in limestone regions, where the rock is soluble. In these areas, water often finds its way below the surface,

and dissolving the rock flows underground. The Indus, Brahmaputra and Yangtse have carved out very deep gorges; but one of the most famous is the Colorado canyon in America. It is 300 miles long and in some places over a mile deep.

The head-waters of a river are often dammed in connection with water-power schemes. The water is then led to a power-house at a lower level. There it operates turbines, which in turn operate dynamos. The electricity so generated is led away by cable to be

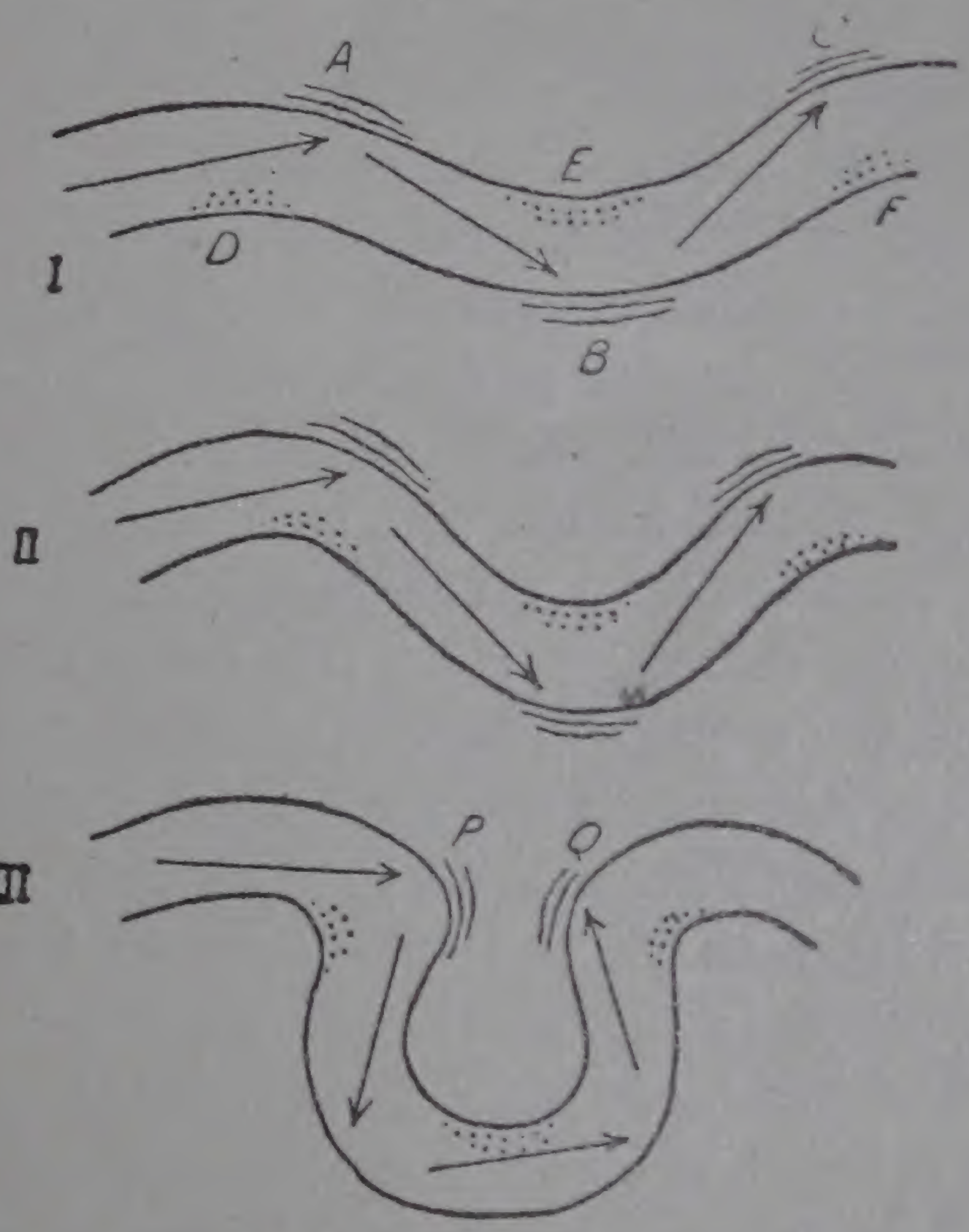


FIG. 37.—THE ACTION OF A RIVER AT A BEND IN ITS COURSE.

The current is strongest in the direction of the arrows. The water cuts away the banks at *A*, *B*, *C*. Sediment is deposited at *D*, *E*, *F*, where the water is moving more slowly. Thus the bend becomes more and more pronounced as shown in the three stages. In time the river will cut through the neck of land between *P* and *Q*.

used in industries. There is such a scheme on the Keyna river, south of Bombay. There are numberless opportunities to develop power schemes in the Himalayas and the Western Ghats.

In the second stage the river is flowing through a valley it has carved during past ages; action is partly destructive and partly constructive. The river flows in large bends. At each bend

erosion is in progress on the outer side, whilst sediment is being deposited on the inner side where the water is moving more slowly. When heavy rains or melting snows swell the river, water floods the land within the bends. These plots therefore receive a layer of sediment. Hundreds of such floodings have made them level and fit for cultivation (Fig. 37).

River valleys provide means of communication through the mountains. They have proved of immense value in carrying railways through the Alps, Rockies, Andes and other ranges. Two valleys on opposite sides of a mountain range are frequently connected by a tunnel. Famous Alpine tunnels are the St. Gothard, 9 miles long and the Simplon, 12 miles long.

Waterfalls occur in the valley stage where a hard bed of rock lies next to softer ones. As soon as part of the softer rock is worn away, there is a small waterfall. It increases in height as erosion continues. At the same time the soft rock under the hard ledge is eaten away. Then the ledge overhangs. Finally a piece is broken off to fall into the channel below. Thus the waterfall is pushed back upstream, and a gorge is formed below the fall. The Niagara gorge, formed in this way, is seven miles long. There is a gorge of the same kind below the Narbada Falls, near Jubbulpore.

In the third stage the river is flowing over land that is almost level. The current is feeble. Often the river winds along in irregular bends called **meanders**. Its action is mainly constructive. Sediment brought from higher levels is deposited upon its bed. Thus the channel becomes shallower. After heavy rains inundations occur; the land beside the river is flooded with muddy water for many miles. When the floods subside, the river sometimes finds a new way to the sea. This has happened many times in the plain of the Hoangho ("China's Sorrow").

It is by such inundations, repeated time after time during thousands of years, that the flood plains of the Ganges and Brahmaputra, the Tigris and Euphrates, the Nile, the Mississippi, the Italian Po and others have been constructed. The soil of these plains consists of mixed material, brought from many parts of the river basin. It is finely divided, deep and rich—wonderful for raising crops. Every inundation renews its strength, so that manures are not required.

When a pebble, far away on the mountains, is washed by rain into a stream, it is beginning a long journey to the sea. A flood may carry it into the fields, and leave it there for years. Some day it will be washed back to the river, and continue its seaward journey. So does all sediment travel towards the ocean. When river waters

FIG. 38.—A GORGE NEAR JUBBULPORE.

come to rest in the sea, their sediment drops to the bottom. There it accumulates until a sandbank rises to the surface. Many sandbanks may form. The waters of the river flow between them in branches called **distributaries.** This triangular area of sandbanks and water channels is a **delta,** so named from its resemblance to the Greek letter delta, Δ.

The delta is part of the plain. It is the portion of the plain the

river is still making. Seeds will be washed on to the sandbanks, or be carried there by birds. Plants will grow in the moist soil. They will bind the soil together and help to make solid land. The river will often surge over it, deposit sediment, and so raise it above the average level of the water. Then more sandbanks are built, and the process goes on, the plain gradually extending.

Considering its size, the Italian Po is the hardest working river in the world. It is pushing out its delta into the Adriatic sea. The

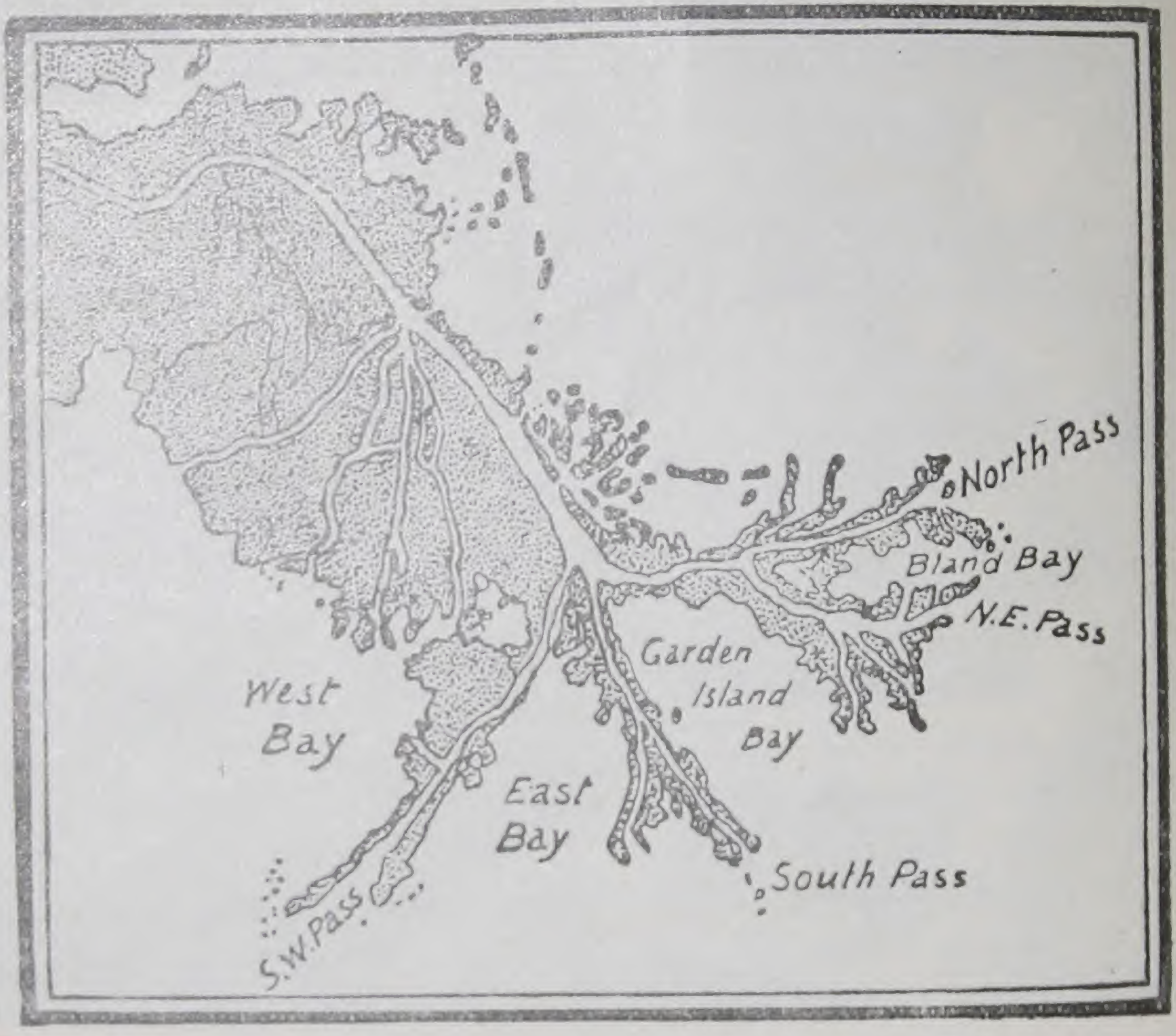


FIG. 39.—THE DELTA OF THE MISSISSIPPI RIVER.

port of Adria gave its name to the sea—but it is now 14 miles inland. The Mississippi has a palmate or hand-shaped delta.

One of the largest deltas in the world is that of the Ganges and Brahmaputra. It is over 50,000 square miles in extent. It has been bored to a depth of 480 feet. The deposits it contains are sands, clays, pebbles and some plant remains, including trees.

Currents and tides may operate to prevent the formation of a delta. A river then enters the sea by an **estuary**—a broad channel

where river and sea waters mingle. Even in an estuary sandbanks may be formed. The port authorities of Liverpool and London spend many thousands of pounds every year dredging the Mersey and Thames estuaries.

River plains are excellent regions for human settlements. The soil yields crops of foodstuffs for a large population. Water is available for domestic and industrial purposes. The level land facilitates the making of roads and railways. The river is a convenient means of transport. Proximity to the sea encourages foreign trade. The sluggish river is favourable to navigation by sea-going ships. The most unfavourable circumstance is the liability to inundation. This is to some extent guarded against by the construction of embankments like those along the lower Ganges, the Hoangho and other rivers.

On the Himalayas there is a line above which snow remains on the ground throughout the year. This is the **snow-line.** The height of the snow-line varies with latitude. In the Himalayas it is 15,000 to 20,000 feet above sea-level, being about 4000 feet higher on the *north* than on the south side. In the Alps the snow-line is 9000 feet above the sea ; in the polar regions it descends to sea-level.

Snow cannot go on accumulating above the snow-line for ever. It escapes in several ways. Some melting and evaporation take place, but the amount so removed makes little difference to the vast snowfields of the Himalayas and Alps. There are two other ways in which snow is removed. One is by **avalanche,** a sudden and swift method ; the other is by **glacier,** a very slow method.

An avalanche is a huge mass of snow hurtling down a mountain side. It hurls rocks from their places, snaps tree stems like matches, and sometimes lays villages in ruins.

The huge quantity of snow that accumulates at the head of a mountain valley is very heavy. It exerts great pressure downwards. The pressure has two results ; it converts the snow into ice, and it sets the ice in motion. Very slowly a tongue of ice stretches out downhill. It is the beginning of a **glacier.** Behind follows a never-ending stream of ice, for more snow is always falling higher up and feeding the glacier.

The glacier, perhaps hundreds of feet thick, moves slowly but irresistibly down the valley. Obstructions are removed. Rocks

become frozen into the base of the glacier. They are dragged like graving tools over the surface of the land, ploughing the soil and making deep scratches on rock surfaces. Thus do glaciers scoop out valleys.

Earth and boulders of rock fall upon the glacier. They are ranged mainly along the sides in what are called lateral moraines. If two glaciers unite, two of these lateral moraines will be combined as a medial moraine.

The end of a glacier is where the rate of advance is equal to the rate at which the ice melts. From this point flows a stream, as the

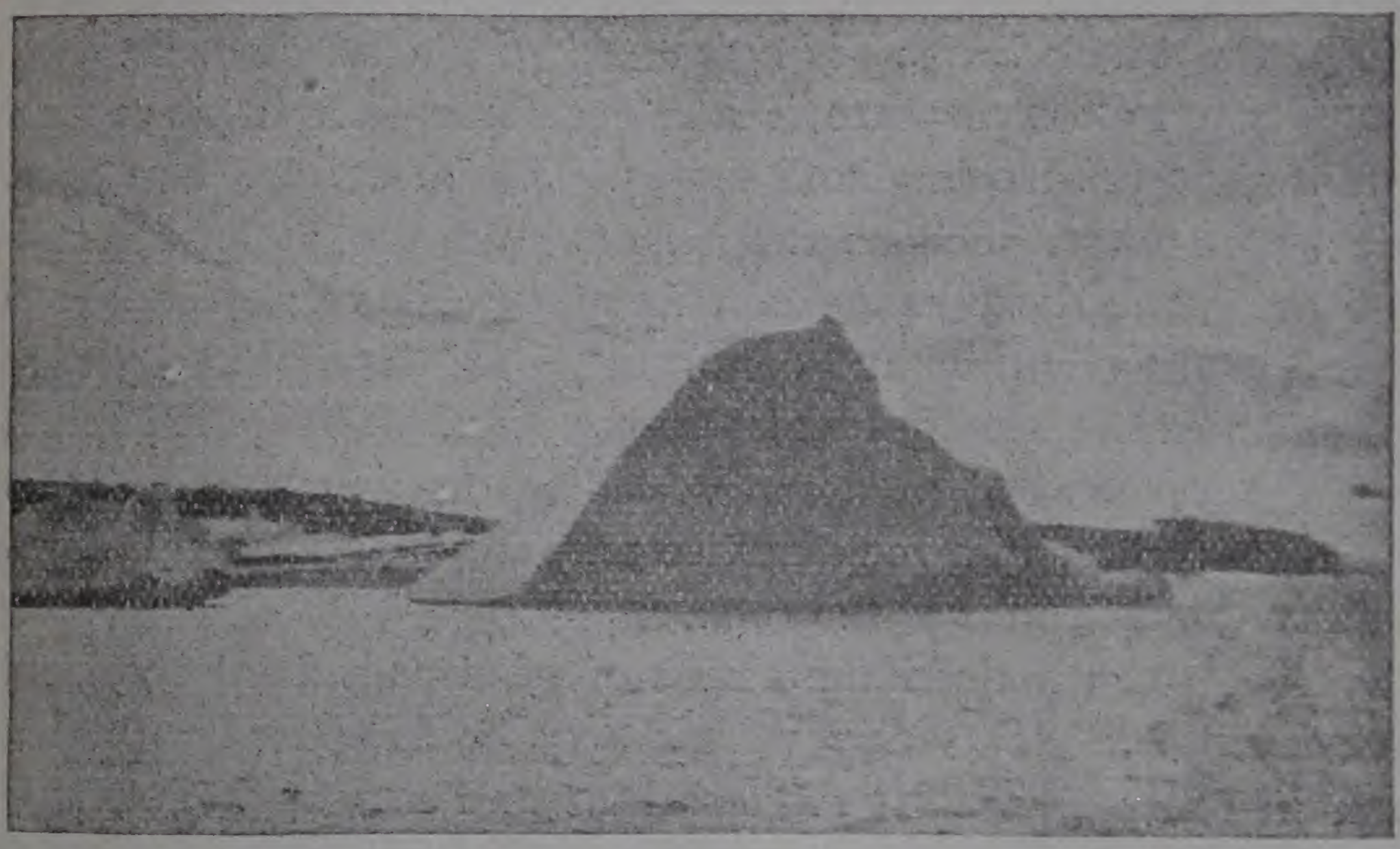


FIG. 41.—AN ICEBERG—ABOUT ONE-NINTH OF THE MASS IS ABOVE WATER.

Ganges does, and the European Rhone. The stream carries away some of the earth and stones the ice has brought from the mountains. Thus ice-carried sediment is distributed by the Ganges on the surface of Bengal ; and some may even reach the sea.

In the polar regions the snow-line is at sea-level. Consequently in such lands as Greenland and the Antarctic continent, glaciers glide into the sea. Then the upward pressure of the water breaks off large portions. These float away as icebergs. Icebergs drift southwards from the Arctic into the North Atlantic. In the early part of the year—April and May—they make navigation dangerous. An ice-patrol is stationed in the Atlantic to locate icebergs and give warning to vessels crossing their track. The morainic material

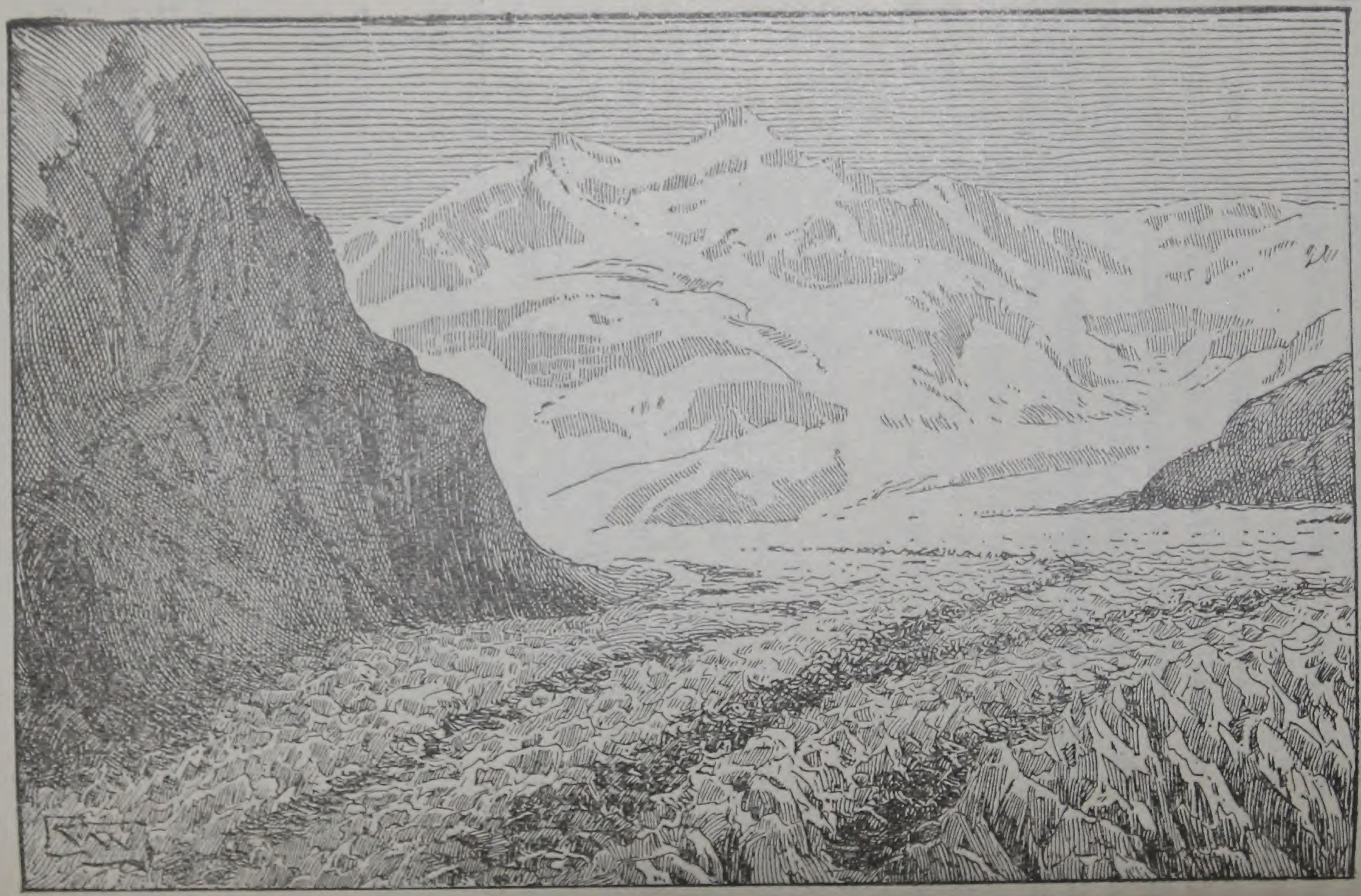


FIG. 40.—AN ALPINE GLACIER, SHOWING LATERAL AND MEDIAL MORAINES

deposited by melting icebergs has helped to form the Newfoundland Banks.

In the temperate zones there are glaciers only on high mountains. At one time—perhaps 50,000 years ago—the northern hemisphere had a cold climate. Ice-sheets spread over a large part of Eurasia and North America. Many valleys in these regions were shaped by glaciers during that **Great Ice Age.** In some places valleys were dammed by moraines and lakes were formed. In all northern countries the glaciers of the Ice Age have left morainic material. It is distributed irregularly over the land, and has of course given a greater depth to the soil. The famous wheat-growing land of Russia, the Black Earth—is composed of glacial deposits.

Variation in temperature is a silent force, but it plays an important part in shaping land forms. Its effects are best seen in wide bare spaces, such as the Sahara and the Gobi desert. In these areas the daily range of temperature is very great. Rocks expand in the day time and contract during the night. The strain thus produced gradually breaks up the rock. This partly explains the presence of sand in deserts. Where temperature falls below 32° F., rain water in a rock crevice may freeze, and expanding, act like a wedge driven into the rock.

Everyone has noticed the action of **wind** on a dusty road. The work it does in dry sandy wastes may be compared with that of water in other areas. It reduces hills and fills up hollows. The huge Egyptian monument called the Sphinx was at one time buried to the neck in wind-borne sand. The ruins of Nineveh lay for centuries below the drifting sands of Mesopotamia. The wind piles up **sand dunes** in the desert. No sooner are they formed than the wind begins to re-make them, farther on; the dunes appear to travel. In Rajputana there is what looks like a "sea of sand." Dunes stretch in long almost parallel lines. Their long gentle slope is towards the south-west, whence come the prevailing winds. Sand dunes are formed along the Malabar coast, and on the shores of many other countries. Frequently they silt up the mouths of rivers, turning the stream parallel to the coast and forming lagoons. Sometimes, however, sand dunes help men to reclaim land from the sea; this has been done in Holland, Belgium and France.

Perhaps the most remarkable action of wind is the formation of loess. This is the name given to thick accumulations of soil, evidently carried by wind. Deposits of loess occur in North America and Europe, in Baluchistan and the Punjab, but they are most noteworthy in China. North of the Tsinling mountains, and especially in the province of Shansi, loess is found in large masses. It fills up what were once valleys to the depth of 1500 to

FIG. 42.—THE DISSECTED EDGE OF THE DECCAN.
(Matheran, Bombay.)

2000 feet. The loess is light, rich, and easy to work. Its chief disadvantage is that it will not hold water ; it is too porous. Hence good crops are obtained only if the land is irrigated. The Chinese loess is considered to consist of dust carried by dry winds from inner Asia.

EXERCISES

1. Name the three stages in the course of a typical river, and describe the work done by running water in each stage. Illustrate your answer by reference to rivers in India.

2. Why have the flood plains of rivers usually a large population? Mention flood plains which have a very small population and give reasons.

3. Explain the terms, snow-line, avalanche, glacier. Describe the work done by moving ice upon the surface of the earth.

How can you explain the curious fact that the snow-line is higher on the north than on the south side of the Himalayas?

X. THE OCEANS, TIDES AND CURRENTS

The oceans cover about three quarters of the earth's surface. They lie in huge troughs between the continents. The Atlantic trough is shaped like an hour-glass—narrow in the middle, wider in the north and south. The Pacific trough is like a triangle with concave sides. The ocean troughs are generally believed to have been formed by subsidences of the kind mentioned in the preceding chapter. At the time of the Pacific subsidence, great mountain folds were produced in the continents—the Andes and Rockies in America—and sunken folds now marked by island festoons on the Asiatic side. The Atlantic shores are irregular. This is largely due to the projection of a number of plateaux. On a submarine ridge in the South Atlantic stand the islands Tristan da Cunha and Ascension. The Azores and Iceland stand on a submarine ridge in the North Atlantic. The Pacific is distinguished by a very large number of tropical islands. Some are of volcanic origin, and some are coral islands.

Coral polyps are tiny animals. They live in great colonies. They have a hard skeleton, composed of carbonate of lime, which they extract from sea-water. When they die the skeletons remain to form, in the course of ages, reefs of limestone. Corals die when exposed to air, so the reef cannot be carried above the surface. Fragments of coral rock broken off by the waves and flung on top of the reef, together with other matter floated on to the reef by the sea, form a soil. Seeds carried by birds, or by ocean currents, give the coral islands their vegetation.

Along the margins of the oceans there are deposits of sediment brought from the land by rivers. In this are mingled the remains of creatures that live in the sea. Farther out, deposits on the ocean

floor are mainly organic remains. They consist of the remains of minute creatures that live near the surface of the water. These deposits are called **ooze.**

The bitter flavour of sea-water is due to dissolved **mineral matter,** 75 per cent. of which is common salt. The salinity of the ocean varies from place to place. This is due to variations in the rate of evaporation, and in the amount of river water carried in at different points. In the equatorial low pressure belt there are very heavy rains, and the Amazon, Congo and Niger bring large quantities of **water.** The salinity of the ocean is thereby reduced. The Mediterranean Sea has higher salinity than the ocean. The salinity of the Dead Sea is still greater. Beds of **rock salt** are found amongst the sedimentary rocks, in the Salt Range of the Punjab, in Poland, Germany and other countries. These must have come from the drying up of lakes like the Dead Sea and the Great Salt Lake of America.

Perhaps the most interesting of ocean features is the **ebb and flow of the tide.** It is best seen on the shores of countries on a continental shelf, and in funnel-shaped estuaries. Whilst the tide is "coming in" the depth of water upon the beach gradually increases to **high-water** level. Then the tide turns, and the depth of water decreases to **low-water** level. The interval between two successive high-waters is about $12\frac{1}{2}$ hours. These tidal movements indicate that a large quantity of water rolls first on to, and then off the continental shelf.

The chief cause of tides is the attractive power of the moon and the sun. The moon is much the smaller body, but it exerts a greater pull than the sun because it is so much nearer to the earth.

Think of a globe covered with water of uniform depth. Now suppose the moon is at *M* (Fig. 43). It "pulls" the solid earth, and it pulls the waters on the earth. The water about *A* is nearer than the solid earth, and it is free to move. A bulge is therefore formed at *A*. The water does not fly off the earth to the moon because of the earth's attractive power. *C*, the centre of the earth is nearer to the moon than *B* is. The solid earth is therefore pulled more strongly than the water at *B*. In addition, the earth as it swings round helps to make the bulge at *B*. Thus the level of the water is raised at *A* and *B*, and lowered at *F* and *G*.

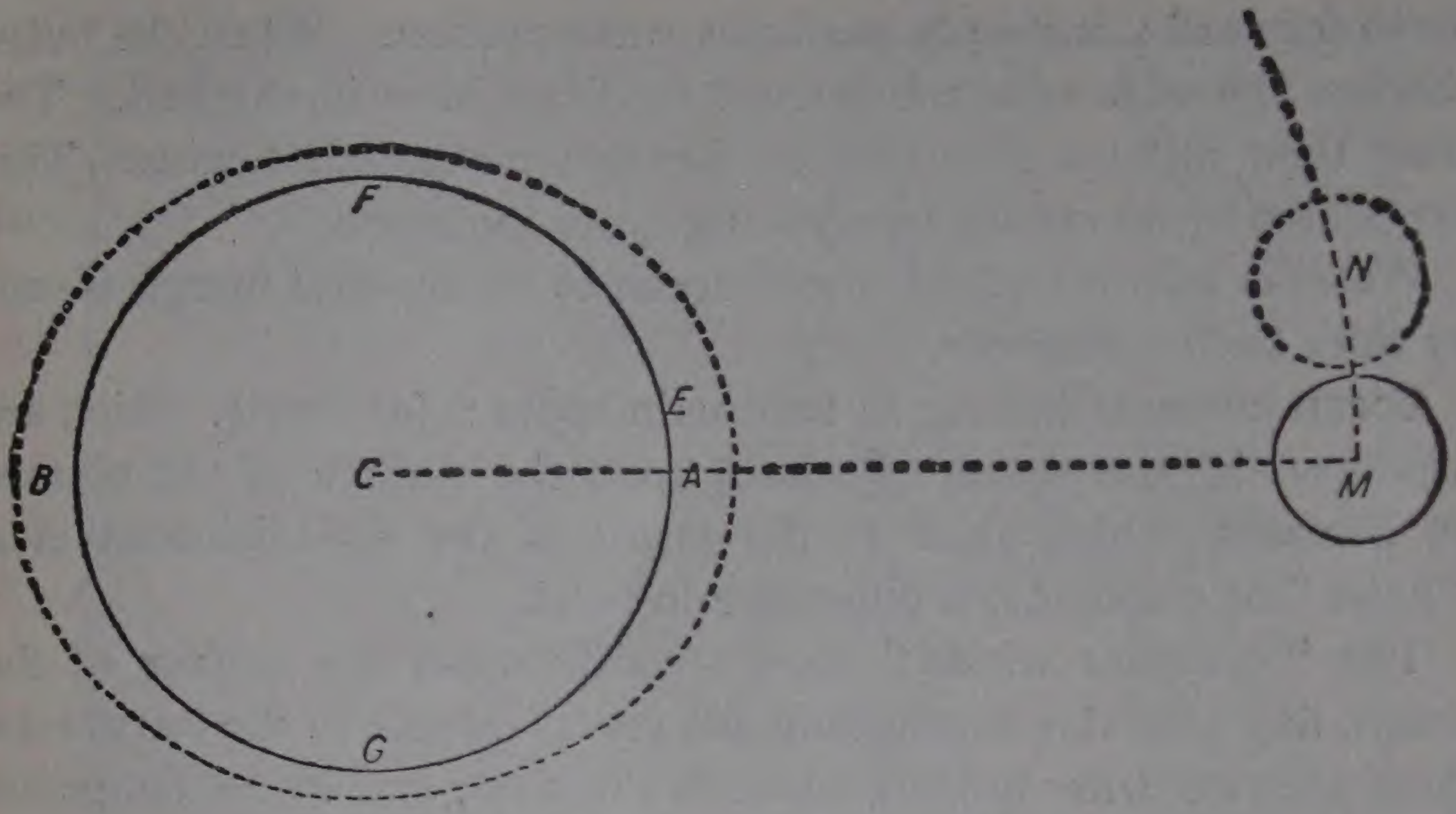


FIG. 43.—THE FORMATION OF TIDES.

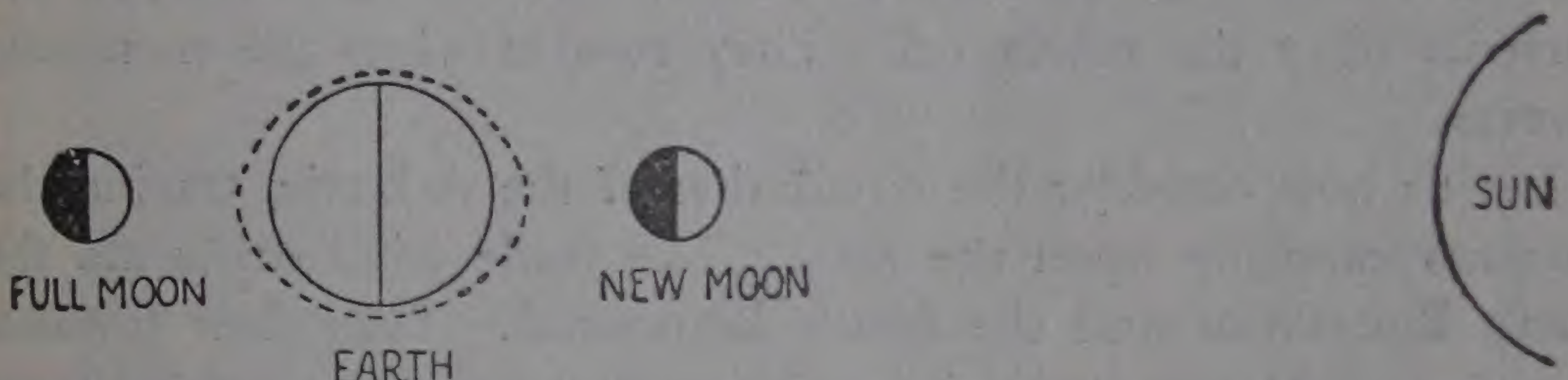


FIG. 44.—SPRING TIDES AT NEW MOON AND AT FULL MOON.

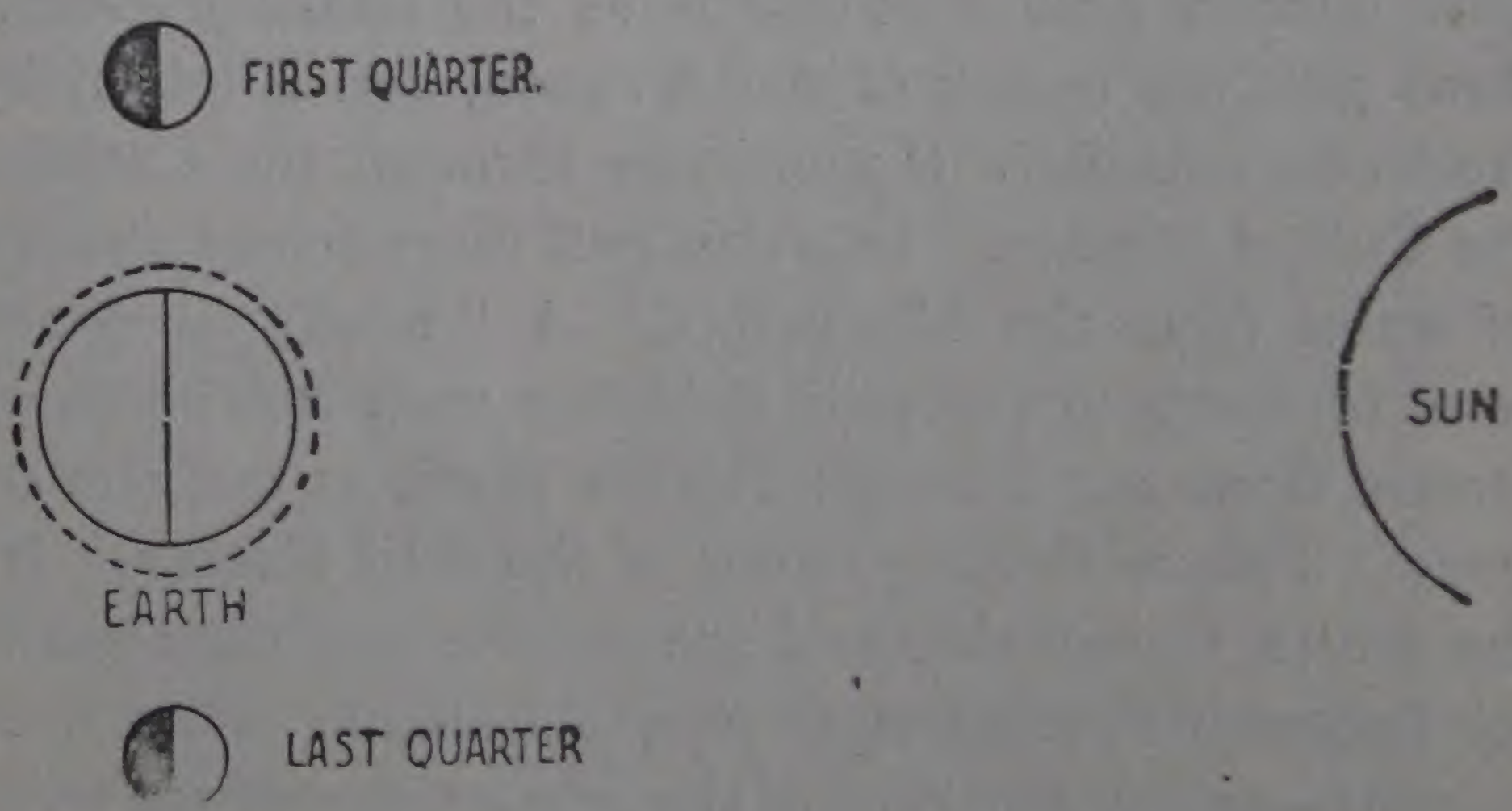


FIG. 45.—NEAP TIDES AT FIRST QUARTER AND LAST QUARTER.

Now suppose a continent to rise above the surface of the ocean at *G*. As it moves towards *A*, the water on its margin will increase in depth. High water will occur when *A* is reached. In a complete revolution the continent will have two "high-waters" and two "low-waters."

If the moon remained at *M* there would be high-water when the continent again reached *A*. But the moon travels round the earth. By the time the continent again reaches *A* the moon has reached *N*. The bulge has therefore shifted to *E*. Hence the tide is said to *lag*. If morning high-water takes place at 10 o'clock on a certain day, it will occur at 10.50 on the following day.

The action of the sun is to increase or decrease the tides produced by the moon. When sun, earth and moon are in a straight line, the sun is helping the moon, and extra high tides called **spring tides** are produced. These occur at "full moon" and at "new moon." At "first quarter" and "last quarter" **neap tides** are produced, because the sun is drawing water away from the bulge produced by the moon (Figs. 44, 45).

In the open ocean the water level is not raised more than two or three feet. But when this bulge reaches a continental shelf, it may raise the level 10 or 12 feet. When it enters a funnel-shaped estuary it is gradually compressed. The front of the advancing water increases in height and it looks like a wall of water. This is called a tidal wave or "bore." It fills up an estuary very quickly. Such is the origin of the famous "bores" which roll up the Bristol Channel of England and the Bay of Fundy in North America. Tidal waves also travel up the Amazon, the Ganges, the Yangtse and other rivers.

The huge mass of water brought into an estuary by the tide is a source of energy scarcely drawn upon at present. Tides help commerce by providing deep water in estuaries, and doing something to scour out sediment brought down by rivers. On the other hand, tidal waves also carry sediment into river mouths, and sometimes cause serious obstruction. This is very noticeable in the Dee estuary and the Wash in England, and the Hooghly in India.

It should be noticed that the water does not move forward except on the continental shelf. When the bulge passes over any point in the open ocean each particle of water rises and falls. It does not

move forward ; it simply performs wave-motion. When the bulge reaches the edge of a continental shelf the base is checked. The crest then topples over and so forward movement begins. This explains why waves are seen rolling on to the shore.

Water is transferred from mid-ocean to continental margins—not by tides but by currents.

Ocean currents belong to two main types : (*a*) **Drifts**, which are produced by the action of winds upon the surface of the oceans. (*b*) **Streams**, which start as the result of the establishment of a "head" of water, *i.e.* a difference in level.

The "constant winds" blow steadily upon the surface of the ocean, day after day throughout the year. Hence in the torrid zone there are two drifts flowing towards the west, and in the temperate zones there are drifts flowing towards the east. These currents exist in both Atlantic and Pacific, and in the southern part of the Indian Ocean. In the Bay of Bengal and the Arabian Sea the currents obey the monsoons. They reverse when the monsoons reverse.

Let us now consider the circulation of the Atlantic, tracing the currents carefully upon the map. The trade wind drifts are the **North Equatorial** and the **South Equatorial.** They flow towards America, doubtless strengthened because the earth is turning from west to east. Between them the **Equatorial counter current** is creeping eastwards—restoring the level.

The South Equatorial is split by the wedge-shaped mass of Brazil. One portion goes southwards as the **Brazil current.** The other flows past the mouth of the Amazon, and is joined by part of the North Equatorial. It continues through the Caribbean Sea into the Gulf of Mexico. Into this gulf there comes also a huge volume of water from the Mississippi. A "head" is established. The level of water in the gulf is higher than it is in the Atlantic. A stream flows out through Florida Strait at the rate of 4 miles per hour. This is the beginning of the **Gulf Stream.** It is joined by the North Equatorial, and the stream continues until it meets the icy **Labrador Current**, near Newfoundland. Here it ceases to be a current—at any rate during the greater part of the year.

Out in the ocean the westerlies are driving the water towards Europe. This current is the **North Atlantic Drift** ; the northern

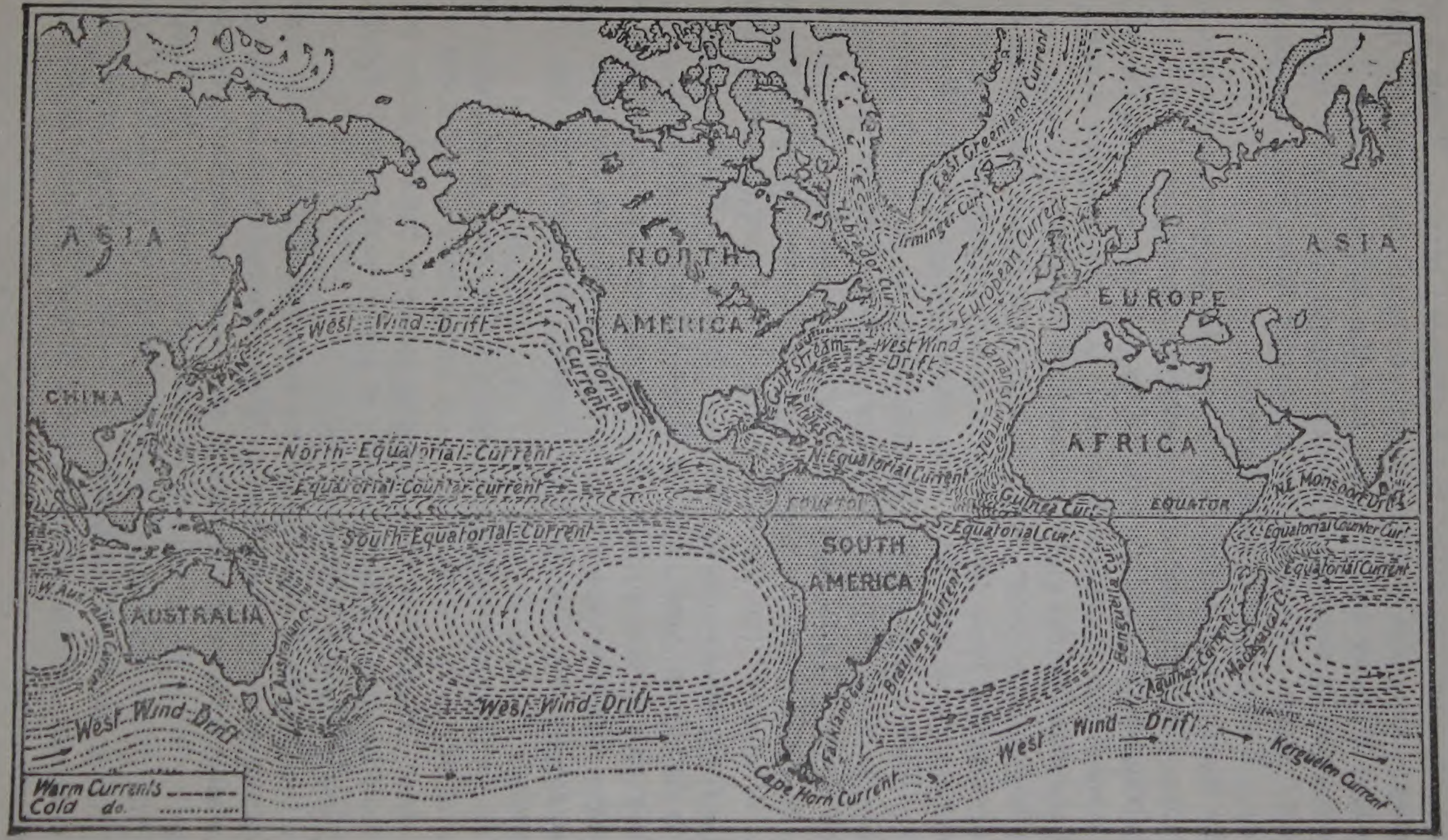


FIG. 46.—OCEAN CURRENTS OF THE WORLD.

portion is sometimes called the European Current. Trace it upon the map. Part of it goes far away to the north-east, past the British Isles and Norway and Iceland, into the Arctic Ocean. The rest accumulates in the space between Spain and Africa, forming a "head" there. Consequently a current flows along the coast of Africa. This is the **Canaries Current.**

The North Atlantic Drift carries masses of warm water into high latitudes. It is instrumental in melting Arctic ice. The "head" established in the Arctic is relieved by outflows, some on the surface and some below the warmer waters. The cold surface streams are the **Labrador Current** and the **Greenland Current.**

Referring now to the South Atlantic, the Brazil Current flows for some distance near the coast of South America. It gradually swerves seaward, and some of its waters merge into the **West Wind Drift.** This drift might be described as a "round-the-world current." Corked bottles dropped overboard in the southern part of the Indian Ocean have been picked up on the coast of Chile. The West Wind Drift sends branches northward along the west coast of each of the three continents—the cold **Benguela Current** along the African coast, the cold **Humboldt Current** along the South American coast, and the **West Australian Current.**

From the above account it will be seen that circulation is in opposite directions in the two portions of the Atlantic. It is *clockwise* in the North and *counter clockwise* in the South Atlantic.

The swirling currents of the West Indies tear away large quantities of seaweed. This they carry along until it edges out of the currents. Much of it finds a resting place in the still water east of the Gulf Stream. There it floats or grows in the water, forming a **Sargasso Sea,** *i.e.* a "seaweed sea."

In the Pacific Ocean there are **monsoon drifts** off the west of Mexico and Central America. They reverse their direction with the winds, as do the currents in the Arabian Sea and the Bay of Bengal. With these exceptions the circulation of the Pacific is like that of the Atlantic, and the circulation of the Indian Ocean is like that of the South Atlantic. Pick out on a map of the Pacific the currents corresponding to those of the Atlantic, and carefully note their names.

Ocean currents give a little assistance to ships, but their influence upon climate is very great. Currents which go from lower to higher latitudes are continually bearing huge masses of warm water into cool seas. Those moving to lower latitudes bring cold water and frequently icebergs into warmer seas. Look at the January isotherm map. The 32° line leaves the coast of North America near New York, 40° N., and swings in a slanting direction across the Atlantic and into the Arctic Ocean—to 70° N. That is, Hammerfest in latitude 70° N. has the same average temperature as New York in January. Hammerfest has an ice-free harbour in spite of its " nine-weeks night " in winter. The St. Lawrence is blocked with ice for several months. These are effects produced by the North Atlantic Drift in the case of Norway, and the Labrador Current in the case of the St. Lawrence and New York.

Wherever a warm current is flowing there will be warm moist air above it. This, carried on to cool land, will cause rainfall. If the warm current meets a cold one its water-vapour will be converted into a fog. This happens where the Gulf Stream meets the Labrador Current.

Cold currents generally have a drying effect upon the climate of land near which they flow. The Benguela Current is an example. It causes much fog and cloud along the shores of Angola, but little rain. The air over the current is so cold that it cannot hold much water-vapour. When it reaches the warm land it is more ready to pick up moisture than to yield any. The Humboldt Current has a similar influence on the west coast of South America

EXERCISES

1. What is the general direction of circulation of ocean waters in the northern and southern portions of the Atlantic and the Pacific ? State the causes, and illustrate your answer with sketches.

2. The St. Lawrence estuary is blocked with ice for several months every year. European harbours in the same latitude are always ice-free. What is the explanation ?

3. What regions suffer from fogs through the action of currents ?

4. Name the Pacific current that corresponds to the Gulf Stream and describe its course.

XI. FACTORS WHICH MODIFY CLIMATE

Amongst matters relating to man's life and work upon the earth, climate is of outstanding importance. Climate determines which parts of the earth he shall occupy. It determines how he shall live—the kind of food he must eat, the amount and kind of clothing he shall wear and the crops he may grow.

This short chapter is therefore devoted to a summary of the factors which modify climate. Most of the points have been dealt with in preceding chapters, to which reference should be made for further details.

1. **Latitude.** As distance from the place where the sun is overhead increases, rays become more slanting, therefore *insolation* is reduced. Note that the coldest inhabited place is not the farthest north; and also that the "heat equator" shifts northward and southward, following the sun. (Refer to Chapter III.)

2. **Altitude of the land.** Temperature falls as distance above sea-level increases, at the rate of about 1° F. per 300 feet. Quito, in Ecuador (altitude 9350 feet), latitude 0° 20′, has 55° F. as its highest mean monthly temperature. Guayaquil, on the coast not far from Quito, has highest mean monthly temperature 78°. The mean June temperature of Delhi (718 ft.) is 92·2°, and of Simla (7232 ft.) 66·9°. (Refer to Chapters III. and V.)

3. **Nearness to the sea.** The sea is warmer than adjacent land in winter and cooler in summer. Moist breezes from the sea *temper* the climate, making winter warmer and summer cooler. Places near the sea have an equable climate; places remote from the sea have an extreme climate. Continental margins also receive more rainfall than interiors. (Refer to Chapter VI.)

4. **Position on continental margin.** Trade winds blow on to eastern margins of tropical lands, and away from western margins. The western margins in trade wind belts are deserts. The "westerlies" blow on to western margins of temperate lands, carrying rain; this is supplemented by cyclones or depressions. Sub-tropical western margins have winter rains; sub-tropical eastern margins have summer rains. (Refer to Chapter VII.)

5. **Ocean currents.** Warm currents increase the rainfall of lands to which they flow; they temper the winter of continental margins in higher latitudes. Cold currents reduce the rainfall of lands along which they flow, but they cause fogs and lower the temperature on the shorelands. (Refer to Chapter X.)

6. **Position and direction of mountain ranges.** Mountains which intercept sea-winds cause relief rains. Seaward slopes are wetter than landward slopes. If the mountains are near the coast, as in the case of the Cascades, the Western Ghats and the Arakan Yoma, there will be a "rain-shadow" region behind them. Victoria (Vancouver Island) has an annual rainfall of 31 inches; Kamloops, just on the other side of the Cascades, has 10 inches. Akyab on the coast of Burma has an annual rainfall of 193 inches, whilst Mandalay has only 32.

Mountain ranges also deflect winds. The Himalayas, for example, turn the monsoon up the basin of the Ganges. Mountains also produce winds of the Chinook type. (Refer to Chapter VII.)

7. **Slope of the land.** In the north temperate zone the southward slope is the warmest and the northward slope is the coldest. One receives midday rays at a high angle, the other receives little heat from the sun. The reverse holds for the southern temperate zone. East and west slopes receive morning and evening rays respectively, and are warmer than northward slopes. Siberia suffers because the general slope of the land is northward from the great continental watershed. The southward slopes of the Himalayas are particularly favourable to plant life.

8. **Character of the ground.** Different kinds of rock or soil absorb heat at different rates. Rock which becomes hot quickly also cools quickly. For this reason sandy deserts like Rajputana and the Gobi have great daily and annual ranges of temperature. In the Tarim basin the *daily* range is about 36°. Kashgar has an annual range of 60°; and Uliassutai, near the edge of the Gobi desert, has an annual range of 80°.

Where the soil is deep alluvium, like that of the lower Ganges basin, the range of temperature is reduced. Patna has an annual range of 27°, but Jacobabad, in nearly the same latitude but close to the Thar, has so great a range in a single day; whilst its annual range is 40°.

9. **Amount of vegetation.** The great range at places mentioned in the preceding paragraph is due in part to scarcity of plants. Vegetation has a tempering effect upon climate, and by checking evaporation, it helps to keep the soil moist. The climate of Egypt is believed to be much drier than it was in former times through the destruction of vegetation. A similar change has been experienced in New Zealand through the destruction of forests.

XII. VEGETATION AND ANIMAL LIFE

Most people have noticed that even so hard a surface as stone provides a home for plant life. A stone wall gradually becomes overgrown. First appear such lowly forms as fungi and lichens. They help to break up the surface of the stone. Then mosses appear. These are followed by ferns. Seeds carried by birds or the wind take root in the moss, and flowering plants spring up. At a later stage there may even be shrubs. Each kind of plant prepares the way for the following one.

In some such way as this vegetation must have spread over the bare rocks of the earth millions of years ago. Thus was the world made fit for occupation by animals and by man.

In addition to soil, sunshine, warmth and moisture are required for the growth of vegetation. All plants do not require the same amount of warmth and moisture. The oak will grow under conditions that would kill the oil-palm. The pine flourishes in regions unsuited to the oak. Grass grows where the climate is too severe for trees, and lichens where even grass cannot exist.

Climate controls vegetation. If two different parts of the world have the same kind of climate, we may expect them to have the same kind of vegetation. We should call them **Natural Regions** of the same type. They are regions made alike by nature. Natural regions may be classified by climate or by vegetation, since one is dependent upon the other.

The following is a broad classification of natural regions:

1. Forest, in regions of abundant rainfall.
2. Parkland, in regions of moderate rainfall.
3. Grassland and Tundra, in regions of low rainfall.

4. Scrubland, in regions of deficient rainfall.
5. Desert, in regions of no rainfall.

These may be subdivided by taking account of temperature as well as rainfall. Forests grow in the temperate zones and in the torrid zone. There are tropical grasslands and temperate grasslands, hot deserts and cold deserts. It must be remembered also that there is seldom a sharp division between two natural regions. Forest passes gradually into parkland, and parkland gradually gives way to grass.

We will now consider the types of vegetation regions and the animal life associated with them.

FORESTS

Equatorial rain forests or selvas cover large areas in the equatorial low pressure belt, where the temperature is always high and rain falls almost every day. These hot wet forests occur in the basin of the Amazon, the Congo basin and Guinea coast, the Malay peninsula and East Indies. They are the most luxuriant forests in the world. Trees stand like tall pillars, draped with coils of lianas or climbing plants. Lianas hang in festoons from tree to tree. Where the land rises into hills or plateaux, the forest thins out into parkland. The seaward edge of the forest consists of **mangrove swamps**.

Moist heat and dense vegetation are unfavourable to animal life. With the exception of the elephant, **animal life of the selvas** consists chiefly of creatures that live in trees, such as snakes and monkeys. In the South American forest there are the jaguar, monkey, sloth, armadillo and leopard. There are myriads of insects, and rich variety of bird life.

The equatorial forests contain many plants of great value to man. Some of these are now under cultivation in plantations made in forest clearings. Among the chief products are rubber, palm-oil, cabinet-woods such as mahogany and ebony, cinchona, cacao (cocoa), breadfruit, and fibres from various palms.

Monsoon forests are not very different from the selvas. They are not quite so dense, and perhaps not quite so rich in natural resources. They occur in the monsoon regions enumerated in an earlier chapter —India (Western Ghats and lower Himalayas), Burma, Malaya,

North Australia, and Central America. Bamboo forests are a well-marked feature in Assam, Burma and the Malay peninsula, and in parts of Africa and South America.

Amongst the typical forest trees are teak and sal, which yield valuable timber; khair, which yields catechu, satin wood, sandal-wood and palms of many kinds. Mahogany is a special product of British Honduras.

Temperate forests include three main types: (1) the sub-tropical or warm temperate forest, mainly evergreen; (2) the cool temperate forest, consisting chiefly of deciduous trees such as the oak, beech, elm, etc.; (3) the cold temperate or sub-arctic forest, which contains mainly coniferous trees such as pines, fir and larch.

The sub-tropical forest occurs on east and west margins of continents in the warm portion of the temperate zones. East margins have heavier rainfall, and west margins in these latitudes suffer from summer droughts; hence there are certain differences in the vegetation.

The sub-tropical *rain* forest is found in the south-east of the United States, South Brazil and Uruguay, East Australia, New Zealand, South China, and there is some in north-east India. Characteristic trees are the magnolia in North America, the araucaria or monkey-puzzle tree of Brazil, quebracho (a Spanish word meaning axe-breaker) of Argentina, the eucalyptus of Australia and the kauri pine of New Zealand. Useful laurels and shrubs are common. Amongst these are the camphor laurel and camellia in China, Formosa and Japan, and the sassafras in North America. The South American yerba, a species of holly, yields maté or "Paraguay tea."

The sub-tropical *dry summer* forest occurs in regions of the Mediterranean type, named on page 48. Characteristic shrubs and trees in the Mediterranean region are the olive, evergreen oak, cedar, palm, cypress, myrtle and laurel. Hot dry summers are very good for ripening fruit. Regions of Mediterranean type are some of the most important fruit-growing regions in the world. Typical Mediterranean fruits are the grape, orange, lemon, fig, peach, apricot, mulberry.

Elevated areas in sub-tropical regions have different vegetation. On ascending the Alps, Sierra Nevada (America) or the Andes, one

passes into the cool and cold temperate forest zones, characterised by the vegetation described below. A tree worthy of special

FIG. 47.—A TROPICAL FOREST ON THE CONGO.

mention is the giant conifer known as " Big Tree " (Sequoia), which reaches a height of 300 feet on the slopes of the Californian mountains.

The **cool temperate forest** includes such broad-leaved trees as oak, elm, ash, beech, maple, birch, together with smaller trees and shrubs like the hazel, hawthorn and wild cherry. Except in beech woods there is a rich undergrowth of shrubs, brambles, ferns and flowering plants. Chestnut woods are a noteworthy feature in the highlands of southern Europe.

Large portions of the cool temperate forest belt have been cleared for agriculture. The belt is represented by tracts of woodland or forest in many parts of Central Europe and the British Isles, in about latitudes 45° to 60°. It dies out towards the east as climate becomes extreme, and is wanting in Central Asia. It appears again in the maritime climate of the Amur region.

Another large tract of this deciduous forest occurs in the St. Lawrence and Appalachian region of North America. There are only small patches in the southern hemisphere, where there is but little land south of 45°.

The deciduous forest yields hard timber. The oak and birch provide materials used in tanning leather. Associated with this type of vegetation are certain fruit trees—the apple, pear, plum, cherry and others—cultivated extensively in Europe, North America, Australasia and South Africa.

The cold temperate forest is made up of coniferous (cone-bearing) trees, such as pine, fir, spruce and larch. They have needle-shaped leaves and the wood is rich in resin and oil. Conifers are therefore able to endure severe climatic conditions.

Coniferous forests extend across Siberia, northern Europe and Northern Canada, separated from the Arctic coast by the treeless plains known as the Tundras. In Siberia the coniferous forest or **taiga** stretches southward to about the 55th parallel. In North America it comes far south of that line (45°), whilst in Europe it is mainly north of 60°.

The long straight stems of conifers furnish telegraph poles, masts, scaffolding-poles, pit-props. The timber is also used for making doors, window-frames and matches. Large quantities are pulped daily for the manufacture of paper. Conifers form the chief source of turpentine and resin.

Many **fur-bearing animals** are found in the coniferous forests. Examples are the squirrel, sable, stoat or ermine, black fox, lynx,

wolf and bear. These are hunted and trapped for the sake of their skins. At one time many of these creatures must have lived in the deciduous forests. The advance of man resulted in their being killed off, or driven to the coniferous belt; but the squirrel, fox, stoat, badger and weasel are still to be found in the less frequented parts of the deciduous forests.

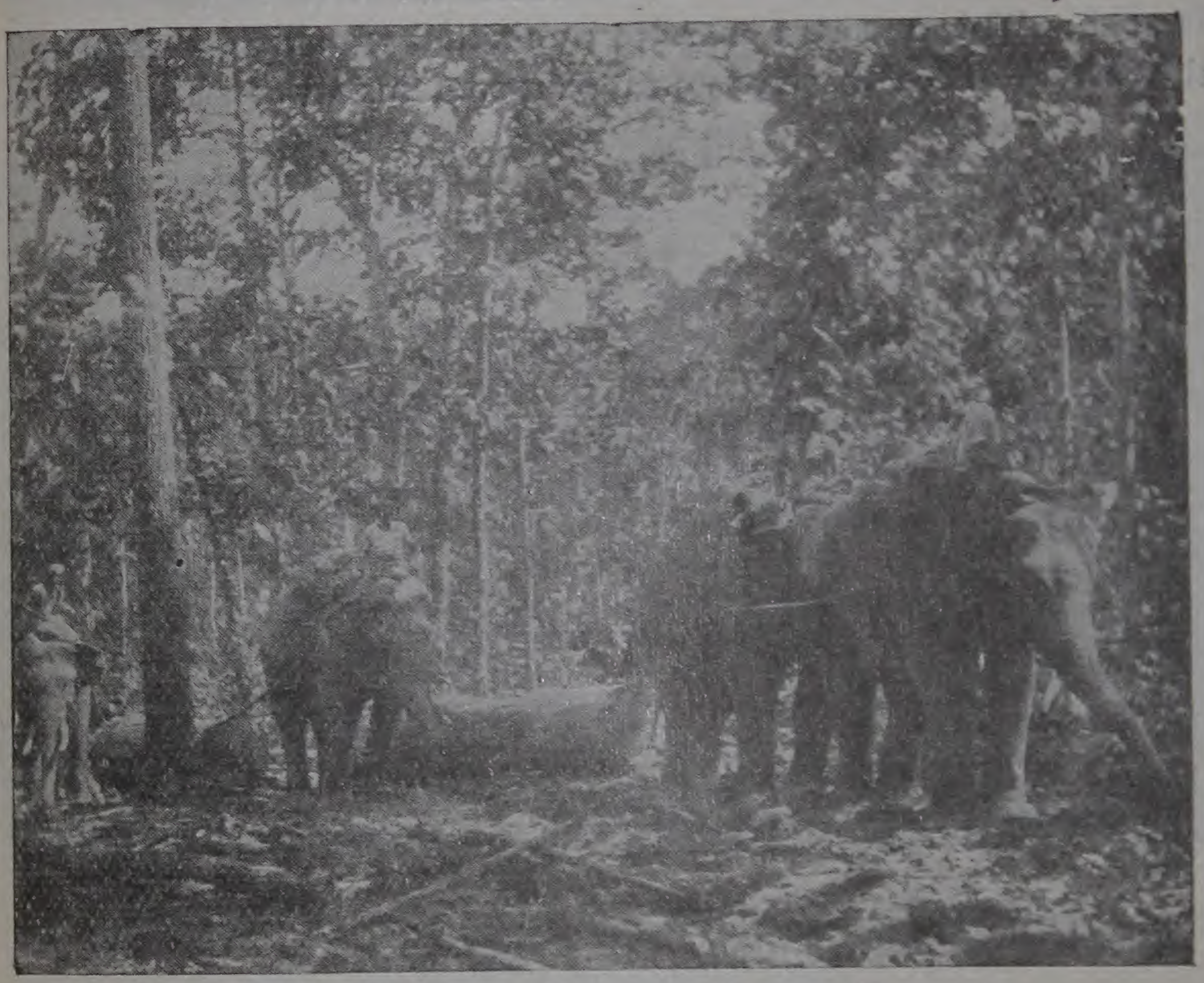


FIG. 48.—SCENE IN MONSOON FOREST (BURMA).

GRASSLANDS

Tropical grassland or savanna occupies a large area in Africa. It forms a belt round the forest, stretching through the Sudan to Abyssinia, then southwards through Kenya and Tanganyika, and westwards through Rhodesia and Angola. Another belt almost surrounds the desert of central Australia. Other tracts, known as **llano** and **campo**, lie north and south respectively of the Amazonian selvas.

Savanna occurs in other regions. Patches of it interrupt the

jungle which extends along the base of the Himalayas. Much of the Deccan must once have borne this type of vegetation.

The savanna regions are subject to long periods of drought. Grass grows to a height of 8 or 10 feet. It becomes parched and brown during the dry season. Thorny shrubs are very common, but trees grow only where there is ground water not far from the surface, or beside rivers. A characteristic tree is the African baobab. This tree has a massive trunk, and roots that go deep into the earth. Its calabash or gourd fruit contains a watery pith some-

FIG. 49.—A HERD OF CATTLE ON THE AMERICAN PRAIRIES.
By courtesy of the C.P. Railway Co.

times called "monkey-bread." Palms are sometimes seen, and the savanna may have a park-like appearance.

The savanna is the home of **big game**. Abundance of herbage, a dry warm climate, and "cover" provided by tall grass and woodland provide ideal conditions. In the African savannas are found the antelope, zebra, rhinoceros, elephant, buffalo, lion and many other creatures.

Temperate grassland is known as **steppe** in Eurasia, **prairie** in North America, **pampa** in South America and **veldt** in South Africa. These lie in rain-shadow regions or continental interiors. Because of low rainfall and great range of temperature trees are very scarce. During winter the ground is frozen and often snow-covered. In early

summer the steppe is converted into a " sea of grass," brightened with flowering bulbs. As the season advances the grass withers, but seeds are sown for next year's crop.

The temperate grasslands have always been feeding-grounds for wild creatures of the " running " type—horses, camels, bison, etc.—and of others, such as the wolf, which prey upon them. Both kinds have been greatly reduced in number by man's advance. Large tracts of steppe-land are used for ranching in both North and South America, and for sheep-farming in Australia and New Zealand. The Asiatic steppes are occupied by pastoral nomads, with large

FIG. 50.—THE SIBERIAN TUNDRA.
By courtesy of U:S. Meteorological Office.

numbers of domesticated animals. Irrigation has transformed many other areas into good agricultural land.

The tundras resemble the grasslands in being almost without trees; in being frozen and snow-covered in winter; and in being the home of nomadic peoples. But winter is longer and more intense in the tundras, for these plains lie around the Arctic Ocean. Long periods of daylight in summer make plants grow quickly. The plants include mosses, lichens, sedges, grasses, and small berry-bearing bushes. Myriads of insects swarm about the pools and marshes. Thousands of birds from southern lands go to the tundras for the breeding season.

Animal life varies with the season. Many creatures migrate to the forest for the winter. The chief animals are the reindeer in

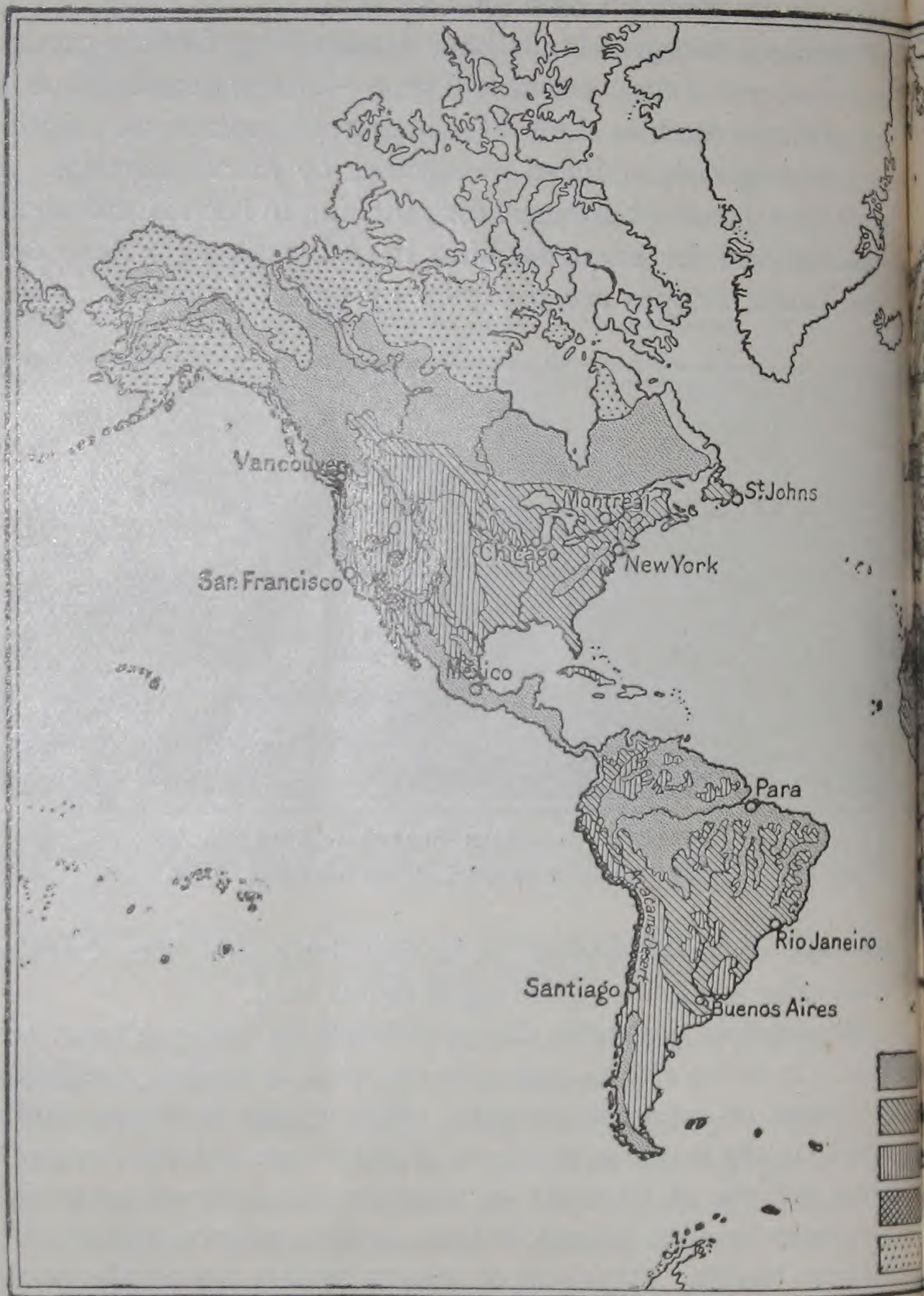


FIG. 51.—VEGETATI

Petrograd
Moscow
Constantinople
Cairo
Arabian Desert
Aden
Zanzibar
Durban
Gobi or Shamo Desert
Lake Baikal
Tokio
Perth
Gt. Victoria Desert
Brisbane
Adelaide
Melbourne
ss & Cultivation
ope

OF THE WORLD.

Eurasia, the moose, caribou, and musk-ox in Canada. There are many smaller animals such as the Arctic fox and Arctic hare, whose coats turn white during the winter. The ptarmigan, a bird about the size of a pigeon, changes its plumage from brown to white for the winter.

Scrubland and deserts. It should be noted that (1) the Tropic of Cancer passes through the deserts of northern Africa and Arabia, whilst the Thar desert, the Persian desert and the Colorado desert of America lie only a few degrees north of that line; (2) the tropic of Capricorn passes through the deserts of the southern hemisphere;

FIG. 52.—A TYPICAL OASIS.
By courtesy of the Algerian Government.

(3) the remaining deserts—Gobi, Takla-Makan and Amu-Daria—lie near the middle of the largest land area, hemmed in by lofty mountains. These facts account for the almost perpetual drought of these regions.

The borders of the desert are scrubland. This bears vegetation consisting of thorny shrubs and plants. They have long roots, penetrating perhaps 20 feet into the ground; they store water in stems or tubers. Acacias and cacti are common scrubland plants. Some acacias, when wounded, exude gum which seals up the scar. The chief source of gum-arabic is the belt of scrubland south of the Sahara.

Oases, made fruitful by water from underground, occur in most deserts. The Saharan oases are marked by groves of date palms. In some of them are villages; the people grow rice, cotton, tobacco

and other plants. The Gobi oases grow willows, poplars, and the fruits and cereals of the temperate zone.

Cold deserts are in the polar regions. They are always covered with ice and snow. Such regions are the interior of Greenland, many of the islands to the north of Canada, and the Antarctic Continent.

EXERCISES

1. Explain why some regions are forested and others treeless, giving an explanation and examples.

2. Name typical trees in the forests of the torrid zone, and the temperate zone. Say what valuable commodities are obtained from each.

3. Explain the terms: steppe, prairie, pampa, savanna, and say where each type is to be found.

4. On an outline map of the world colour the chief types of vegetation region as follows: tropical forests in blue, deciduous forests light green, coniferous forests dark green, grasslands yellow, deserts red.

XIII. THE WORLD'S PEOPLE

Whereabouts upon the earth the first men lived is not exactly known. It is supposed to have been some part of Asia. From that region people must have wandered into other continents. They would travel over "land bridges" which are now partly or wholly submerged. A land bridge must once have joined Asia and Australia; another would join the northern extremities of Asia and North America.

The first men would live on berries, roots and the flesh of small animals and birds. Wild animals would be very numerous. Men would have a hard struggle to exist. Man was superior to other creatures because he could make tools. The earliest known implements were made of stone (flint).

For thousands of years men had stone implements only. This period is called the **Stone Age**. During that age men began to till the soil and to rear animals. They also learned how to make fire, and to manufacture pottery.

After the Stone Age came the **Bronze Age.** This is the period in which men made tools from the softer metals. The **Iron Age** followed the Bronze Age. When the Iron Age started is not known. It extends to modern times—unless we call the twentieth century the **Age of Steel.**

India does not appear to have had a Bronze Age. But many implements made of copper have been found in different parts of the country. This "copper age" was followed by the Iron Age. The use of iron was probably introduced from Babylon.

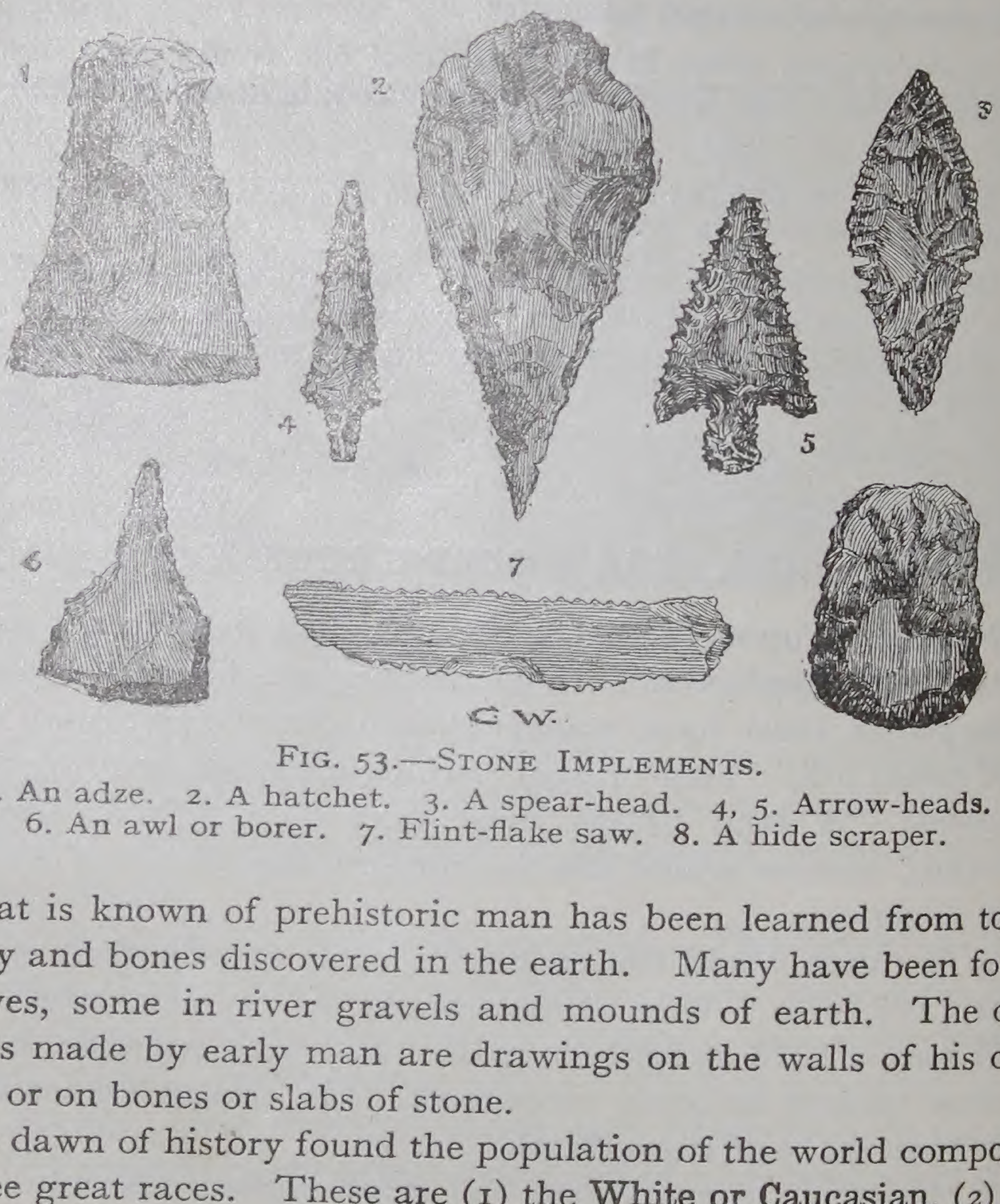


FIG. 53.—STONE IMPLEMENTS.
1. An adze. 2. A hatchet. 3. A spear-head. 4, 5. Arrow-heads. 6. An awl or borer. 7. Flint-flake saw. 8. A hide scraper.

What is known of prehistoric man has been learned from tools, pottery and bones discovered in the earth. Many have been found in caves, some in river gravels and mounds of earth. The only records made by early man are drawings on the walls of his cave home, or on bones or slabs of stone.

The dawn of history found the population of the world composed of three great races. These are (1) the **White or Caucasian,** (2) the **Yellow or Mongolian,** (3) the **Black or Negro.** Two sections of the yellow race—the Brown (Malay) and the Red (American Indian)—are sometimes regarded as distinct races.

In early times the black race occupied Africa south of the Sahara, and parts of the East Indies and Australia; the yellow race was distributed over central and eastern Asia and the Americas; the

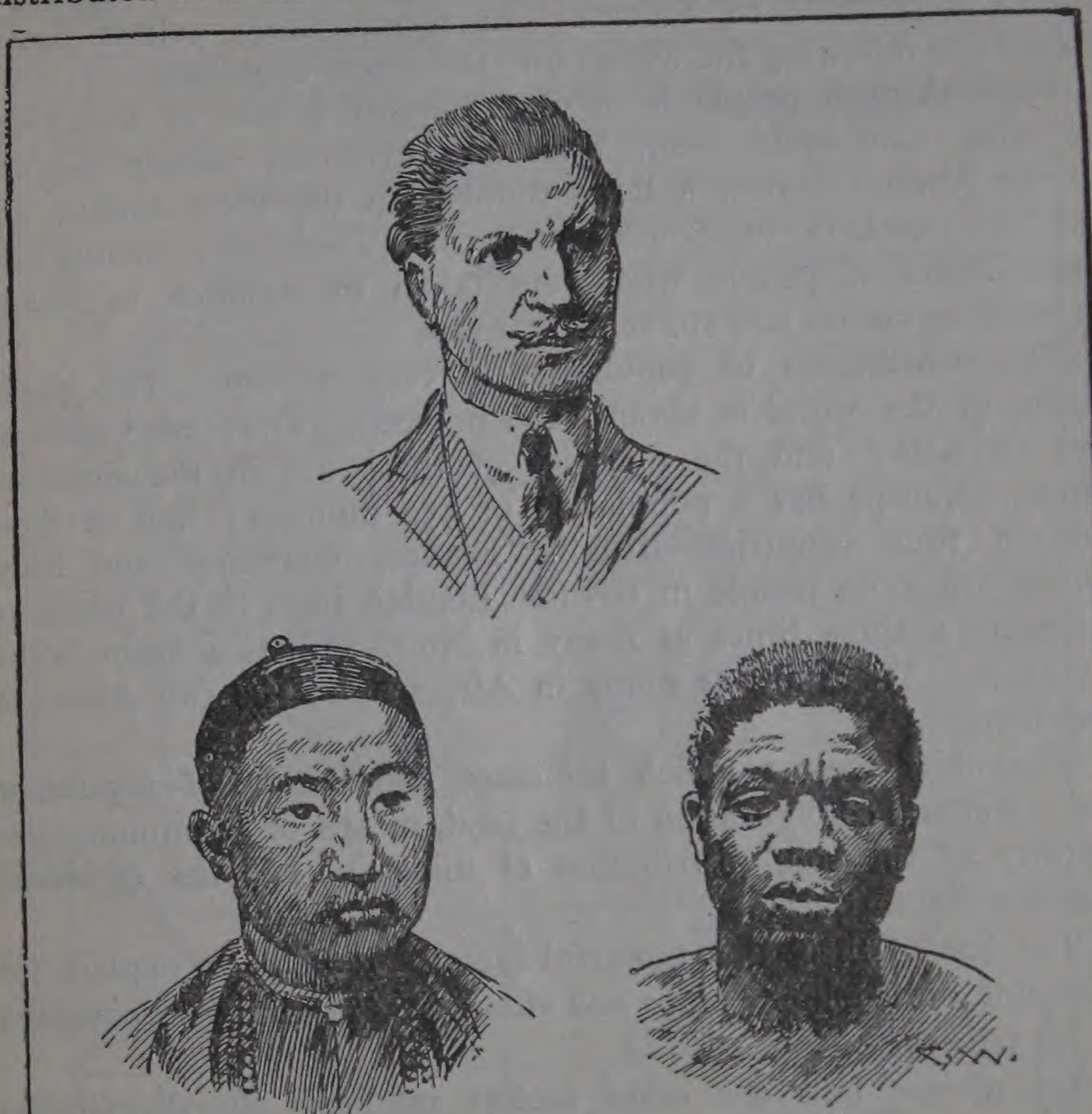


FIG. 54.—TYPES OF HUMAN RACES.

white race was in possession of the greater part of Europe, northern Africa and south-west Asia, including India.

Changes in this distribution have been made by **movements of the yellow and white races.** Before the sixteenth century certain Mongolian peoples made a home in Europe. The Lapps, Finns and others migrated quietly into the northern part. The Magyars, Tartars, Bulgars and Turks fought their way into the centre and

south. Since the sixteenth century a movement of the white race has been in progress. White people have established new nations in the Americas, Australia, New Zealand, South Africa and southern Siberia. In recent times yellow people have been following the whites into these new countries.

Black-skinned people have never shown a love of wandering to other continents. But there are over ten million negroes in the United States, a large number in the West Indies, and smaller numbers in South America. These are mainly the descendants of people who were taken to America as slaves, to work on cotton and sugar plantations.

The distribution of population is very uneven. The population of the world is about 2000 millions. Over 1000 millions live in Asia; and the majority of these are in the monsoon lands. Europe has a population of 550 millions; half of them are in four countries—Britain, France, Germany and Italy. There are more people in Greater London than in the whole of Australia; three times as many in North America as in South America. There are as many in Africa as in the two Americas together.

The chief **factors which influence distribution of population** are: climate, configuration of the land, means of communication, fertility of the soil, distribution of minerals, supplies of water, man's social instinct.

The last of these is a powerful factor. It helps to explain the grouping of people in camps and villages. Man likes the company of his fellows.

Let us see how the other factors influence the distribution of population. Climate is of outstanding importance. Lands near the poles, such as Antarctica and the interior of Greenland, and the higher parts of such mountain systems as the Himalayas, are uninhabited. They are bound in everlasting ice and snow. Even warm regions are uninhabited if they are rainless; in the Gobi, Sahara and other deserts, human settlements are found only in oases.

A long severe winter makes lands around the Arctic Ocean snow deserts for the greater part of the year. The "barren lands" of northern Canada are thinly peopled by Eskimos, who live mainly by hunting and fishing. The tundras of Siberia have a summer

FIG. 55.—DENSITY OF POPULATION THROUGHOUT THE WORLD.

population of Samoyedes and other nomadic tribes, who depend upon the reindeer for existence. These people migrate southward before winter sets in.

People who lead a nomadic life are found also in the steppe-lands of Central Asia, and on the desert borders of both Asia and Africa. Scarcity of water supplies and low rainfall render these areas incapable of supporting a large population. The Kirghiz of Central Asia, and the Bedouins of south-west Asia and northern Africa are pastoral nomads. They wander with their animals from one pasture-land to another.

Quite different from the regions already mentioned are the tropical forests of the Amazon and Congo basins; but these also have a small population. There is no shortage of water. The hot wet climate is not favourable to human life. The small tribes of these regions are generally stunted in growth. They live mainly by hunting and collecting forest products.

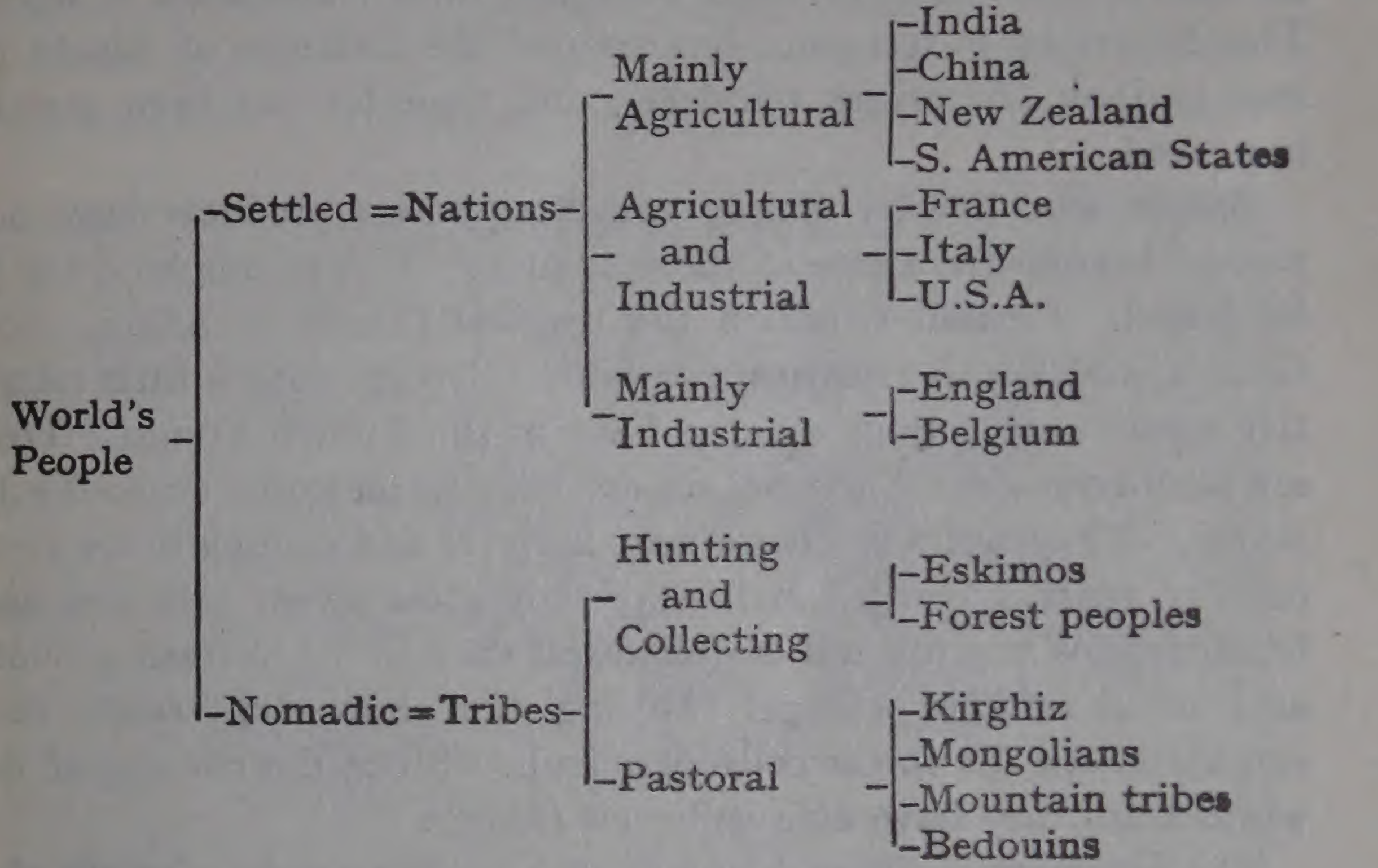
Generally the most densely peopled regions are the river valleys and plains of warm lands. The river provides drinking-water, a highway for trade, and means of irrigating land during dry seasons. The alluvial soil of the valley or plain is usually very productive; it is capable of yielding heavy crops of food. Such valleys are those of the Nile, Ganges and Yangtse.

In some countries, such as England, France, Belgium and Germany, population is most dense in the areas that yield coal and iron. The presence of these minerals has led to the development of great industries, which find employment for large numbers of people.

Some groups of people we describe as "nations," others we name "tribes." Nations occupy areas with definite boundaries. They have a well organised system of government under a recognized ruler. Tribes generally roam over wide areas. Their head, when they do combine, is a chief or sheikh.

Settled people depend mainly upon agriculture for food supplies. Many have developed manufacturing industries. Some give more attention to manufactures than to agriculture; they import food-stuffs from other countries. Nomadic peoples depend mainly upon animals for food supplies. Some live by hunting and fishing, others by rearing animals. According to the animal which is their main

support, we may describe such people as camel-men, reindeer-men, seal-men, etc. Some people are described as semi-nomadic. They roam during the warm season only. Examples of these types of people are given in the summary below; in the next chapter we shall notice the mode of life of some typical nomads.



EXERCISES

1. Name some densely-peopled, and some thinly-peopled regions in the world, and account for the difference in population.

2. Name three regions where nomadic people are found. Say what conditions led them to adopt the nomadic life.

XIV. NOMADIC LIFE

Nomadic tribes are found chiefly in the far north, or in the interior of continents. These areas are not suitable for cultivation. Their inhabitants are obliged to go without the luxuries and many of the comforts of civilisation.

The Eskimos live on the shorelands of Greenland, Alaska, and northern Canada. These lands have a long severe winter and a short warm summer. The Eskimo shapes his life according to

the season. In winter he lives in a snow hut, and feeds on seal-blubber. Without the seal he would not be able to get through the winter. In summer he moves into a skin tent, obtains fish from the rivers, and hunts caribou and musk-oxen on the tundras. When he travels over land he uses a sledge drawn by dogs. On the sea he uses a boat made of skins stretched on a framework of wood. The American government has trained the Eskimos of Alaska to rear caribou (American reindeer), and their lot has been greatly improved.

People who live by simply **collecting forest products** have not passed beyond the stage of the first men. Few of this kind are to be found. Certain tribes in the tropical forests of Africa, New Guinea, and South America, combine collecting with a little primitive agriculture. Such are the **Fans** of the French Congo. They are semi-nomads. Their houses are rude frameworks covered with leaves. They build a village near a river, and occupy it for three or four years. During their stay they grow sweet potatoes and bananas. When the soil is exhausted they move to fresh ground, and build another village. During the short dry season they ramble about the forest collecting fruit. Since the coming of the white man, they have also collected rubber.

The Lapps of northern Europe, and the **Samoyedes, Ostiaks** and other Siberian tribes are *reindeer people*. The reindeer is as valuable to them as the seal is to the Eskimo. The reindeer is a very useful beast of burden. It is also the mainstay of life of its owners. It provides supplies of milk. When one is killed there is meat; while the skins are used for tents and clothing, horn for cups and tools, and sinews to take the place of string.

The movements of the reindeer-people are governed by the seasons, and the need of fresh feeding grounds for their herds. During winter they seek the shelter of the forest. In summer they wander to the tundras. Being nearer to settled people they are better off than the Eskimos. They take furs, walrus tusks and reindeer skins to town markets. These they sell, and with the proceeds buy meal, tea, tobacco and other goods.

The Kirghiz people are typical steppe-dwellers. They roam over a portion of central Asia, between the Caspian Sea and the Altai **Mountains**. In this region rainfall is deficient. Crop-raising is

impossible except near the rivers which flow from the Altai. The Kirghiz are pastoral nomads. They rear sheep and goats, cattle, camels and horses, according to their means. Their chief requirement is herbage for their flocks and herds. When the grass in one area is consumed, they drive their animals to fresh ground. In winter they make for the valleys. In summer they scatter in the mountain pastures of the Altai region, always looking out for a supply of water. Their dwellings are circular tents (yurts) made of

FIG. 56.—ESKIMOS CATCHING SEALS.
Photograph by Ewing Galloway, N.Y.

skin or felt on a framework of wood. The steppe-dwellers' food consists largely of milk and flesh. But it is supplemented with fruit and cereals obtained from settled peoples in the region; brick tea from China is in common use.

Farther east, on the plateau of Mongolia, are other tribes leading a similar life. Nomad summer camps are to be seen on all the great mountain systems of central Asia—on the Pamirs, Tien Shan, Kwen Lun —and on the plateaux of Iran and Baluchistan.

Much of the trade in central Asia is managed by these nomads. Camels, horses, mules and yaks are used as beasts of burden.

Caravan routes from China, Tibet, India and Russia converge upon the oasis towns—Bokhara, Samarkand, Merv and Tashkend. The bazars of these towns are stocked with goods which may find their way into the shops of English, French and American cities. Amongst them are rugs and carpets, some of which were made in nomadic camps, from the hair and wool of the nomads' animals.

The Bedouin Arabs have their home on the borders of the deserts of Africa and south-west Asia. Bedouin means "man of the desert." The camel is as important to the desert-dweller as the reindeer is to the Lapp. The camel, with spreading toes, a fat-storing hump, a water-storing stomach, nostrils that can be closed in a sand-storm, and ability to thrive on thorny plants is the ideal creature for desert travel.

Bedouins wander on the lowlands in the cool season. As summer approaches they fold up their tents, and load all their belongings on the backs of camels or asses. They go to hilly regions where the climate is cooler and the herbage is fresher. When the dates are ripe, many Bedouins go to the oases. They help to pick the harvest and obtain supplies for their own use. In the 'Fertile Crescent' of Northern Arabia, numbers of Arabs have abandoned the nomadic life and become tillers of the soil.

Many of the Arab nomads are engaged in trade. They have the products of the desert to dispose of. They take dates from the oases, salt from desert lagoons, frankincense and myrrh from desert plants, skins and rugs made in their camps. With such goods they go to places like Baghdad and Damascus in south-west Asia, Biskra and Algerian towns in Africa. Having sold their goods they buy cotton cloth, flour, knives, coffee and other articles.

Think of the difference between the life of the nomad on the steppes, and that of the tiller of the soil in the Punjab. One is often short of food, the other lives in a land of plenty. The mountain tribes of Waziristan look down on the rich plains of India and they raid the people of the plains. Many such raids have been made in the past. Some were so great as to win for the leader the title of "World Conqueror." In the fourth century the Huns under Attila invaded Europe. They helped to break up the Roman

empire. Most famous of all was Genghiz Khan. In the thirteenth century he gathered together the Mongol tribes. He overran China twice. Then he started westwards. He took Bokhara and Merv. He ravaged northern India, and the south of Russia. Before he died he had an empire stretching from the Black Sea to the Yellow Sea. After him came Timur, who covered south-west Asia with ruins. His descendant Baber carried warfare into India and founded the empire of the Moguls

FIG. 57.—BEDOUINS IN THE DESERT, ON THEIR CAMELS.

In early times settled people were unable to check these fierce raiders. The Great Wall of China was built to protect the country against Mongol attacks, but it was not very effective. In course of time settled people invented fire-arms, and thus made themselves superior to the nomads.

EXERCISES

1. Which regions of the world are occupied by the Bedouins and the Eskimos? . Explain the difference in the mode of life of these peoples, referring to food, clothing, dwellings, and means of transport.

2. Give reasons why nomadic tribes are often described as "fierce and warlike."

XV. SETTLED LIFE

FARMING, INDUSTRIES, TRADE AND TRANSPORT

Settled people obtain their chief food by cultivating the soil. Soil consists of the broken up surface of the solid rock, or sediment deposited by rivers. The flood-plains built by rivers in past ages provide the best agricultural land. The **earliest settlements** were made in such regions—in Egypt, Mesopotamia, and China.

Plants grow by absorbing mineral matter from the soil. Water is therefore necessary to make a solution. Rivers which overflow their banks do good service. They water the land and they also deposit fresh soil. Where floods do not occur, and the same crop is grown year after year, the yield becomes poorer and poorer. All plants do not use exactly the same kind of mineral matter. Thus it is a good thing to vary the crops from year to year. This is called "**rotation of crops.**" Pulses (peas, beans, lentils, etc.) have a very good effect on the soil in which they are grown.

Another way of restoring the soil is allowing the land to **lie fallow** for a year, that is to bear no crop. At the present day the most common method of renewing the soil is treating it with **manure** or **chemical fertilisers.** These contain nitrogen, phosphates and potash, which are important foods for plants. Nitrates from the great deposits in Chile, and phosphates from such islands as Nauru in the Pacific are much used as fertilisers. **Artificial fertilisers** are made by extracting nitrogen from the atmosphere. This is done on a large scale in Norway, Italy and Germany. Hydro-electric power from mountain streams is used in the process.

The kind of crop grown in any region depends largely upon the climate. Thus rice requires a hot climate and much water; wheat needs a warm climate and little water. Particulars of the chief crops will be given in the next chapter.

For some plants, such as grain and pulses, the ground must be prepared and seed sown each season. Others, once planted, yield their fruit, leaves etc. year after year. They include rubber, cotton, tea, coffee, cacao and many fruits. These may be distinguished from other crops as plantation products.

All settled peoples use grain as their chief food. Many also

consume animal products such as milk, butter, cheese and meat. These foods are more valued in cool and cold lands than in warm regions. Thus there is another branch of farming—the rearing of animals. This is called **pastoral work.** Animals are reared partly because of the foodstuffs they provide, partly for wool and hair used in making cloth, and hides for leather, and partly for use as beasts of burden.

Settled life led to the development of industries. A few people can produce food for many. Others may therefore do work of a

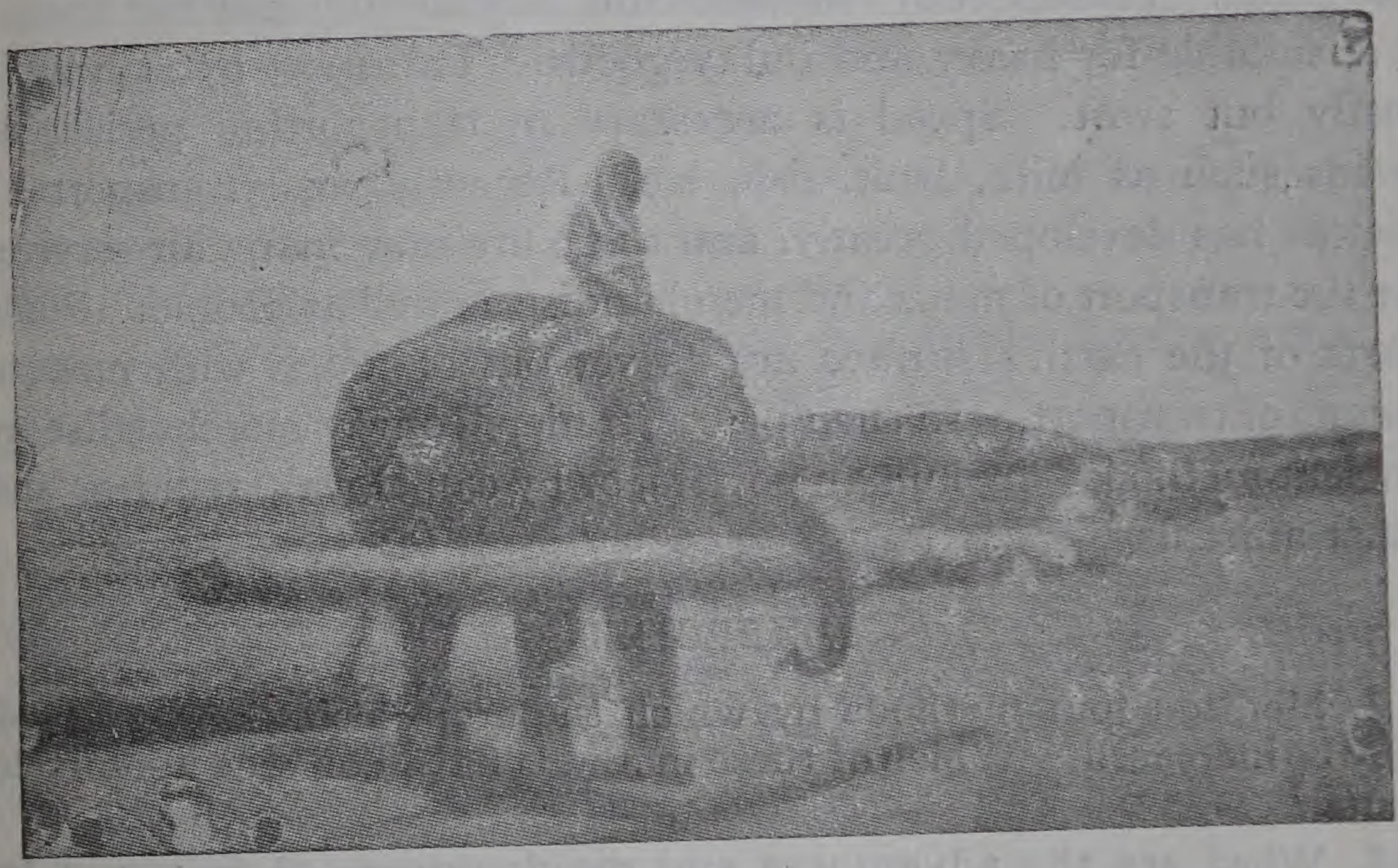


FIG. 58.—THE ELEPHANT IS A BEAST OF BURDEN IN S.E. ASIA.

different kind—building, spinning and weaving, metal-working, the making of pottery, etc.

In early days each home produced its own cloth. **Cottage industries** have survived in India and other countries, but to a limited extent only. At the present day, cotton, woollen, linen, silk and other fabrics are manufactured on a large scale in **factories.** Many looms are required for a factory. This has caused a great development of the iron and steel and engineering industries. **Coal** is used in smelting iron-ore, and in making steel. It is also used in raising steam to drive machinery. Thus the chief industrial countries are those that possess good supplies of coal. China is an exception, but her industries are developing.

The growth of industries caused a great development of international trade. Industrial peoples buy fibres and foodstuffs in many different lands. They have a surplus of manufactured articles to sell.

Transport is the handmaid of trade. Man is ever seeking to improve his methods of carrying goods from one place to another. Sea-trade is of course carried on by ships, many of which are equipped to carry oil, fruit, meat and other special cargoes. Distribution of goods within a country is carried on by railway, road, river and canal. Transport by river and canal is generally slow but cheap; it is suitable for heavy and bulky goods. Transport by railway is costly but swift. Speed is necessary in transporting perishable goods such as milk, fruit, fish, etc. Recently road transport by motors has developed greatly, and there are now many air-services for the transport of mails and merchandise as well as people. Some parts of the earth's surface are as yet out of touch with modern means of transport. In such places, traders convey merchandise by ancient methods—by human porters, or by camel, yak, reindeer and other animals.

EXERCISES

1. Mention four methods by which the crop-raising power of soil may be increased. Which of these methods have you seen adopted in India?

2. What are the advantages and disadvantages of transport by railway and by canal and river? Name articles you would carry by each system.

XVI. FOODSTUFFS AND RAW MATERIALS

The first men must have found the earth clothed with the vegetation described in Chapter XII. Their food would consist of what nature provided—roots, berries, fruits gathered in the forest, with a certain amount of flesh food. At the present day there are forest peoples in Africa and South America who have hardly advanced beyond that stage. In most parts of the world, however, crops of food and raw materials are obtained only by careful cultivation.

Food plants, and those which yield fibres and juices used in industries, were originally " wild." They have been improved, and made to yield more by cultivation. Long experience has taught man how and where to grow his chief plants. He has learned that some will grow in the temperate zone, but that others require the heat of the torrid zone.

Food plants may be grouped according to climatic conditions under which they grow. They are set forth below under three headings, but some have a wider range. The list also includes spices and oils, which are not always regarded as foods.

- **Hot**
  - Rice, millets.
  - Sago, manioc, yam.
  - Sugar-cane.
  - Ground nuts.
  - Coffee, cacao.
  - Fruit—banana, date, mango, pine-apple, lime, coconut.
  - Oils—palm, ground nut, coconut, castor.
  - Spices, etc.—pepper, ginger, cinnamon, chillies, cardamoms, cloves, nutmegs.
- **Warm**
  - Maize.
  - Pulses—gram, lentils, soya beans.
  - Tea.
  - Fruit—orange, lemon, fig, grape, apricot.
  - Oils—olive, cotton seed, linseed, rape seed, sesame (jinjelly).
- **Cool**
  - Wheat, barley, oats, rye.
  - Pulses—peas, beans.
  - Rootcrops—potato (an underground tuber), turnip, carrot, sugar beet.
  - Fruit—apple, pear, plum, cherry, gooseberry, strawberry.

Experiments in growing have produced variety. It has been found possible to " train " plants to grow under varied conditions—to extend their climatic range. There are over one hundred varieties of rice. Some ripen at one period, some at another.

There are even more varieties of wheat, and new varieties are always being produced. Wheat is one of the oldest of cultivated plants. There is evidence that it was grown over 8000 years ago. It was unknown in America before the fifteenth century. Now the United States, Canada and Argentina have a large surplus for export.

The two plants, **wheat and rice**, are most important. Each provides the staple food of at least one-third of the population of the

world. Rice is the chief food in the monsoon lands of Asia, and in parts of Africa and South America ; wheat in southern and western Europe and lands peopled from Europe. The two plants require very different conditions.

The kind of **rice** most commonly grown needs a hot climate and abundance of water. Fields which can be flooded at certain stages are required. Hence the crop is well suited to the deltas of rivers in monsoon lands. **Hill rice** is grown at an altitude of nearly 7000 feet in the Himalayas, and at 4000 feet in Java. This is irrigated by mountain streams. The water is kept at a suitable level by "bunds" or walls of earth. The chief producing areas are the monsoon lands of Asia and the East Indies. Rice is grown on a much smaller scale in the lower Mississippi region, Brazil, Madagascar and Italy, and a little is raised in Central Asia. The crop is consumed where grown, in most cases ; Burma and Siam are the only countries with much rice for export.

Wheat requires only a moderate amount of rainfall, and that should come in the early stage of growth. The soil should be rather heavy—a light clay which will hold moisture and encourage the plant to branch from the root. This is also encouraged by slow growth, so that cool weather when the plant is young is an advantage. Thus wheat is a winter crop in the Punjab, and a summer crop (sown in spring) in Canada. A light soil will produce good quality wheat but a smaller yield. The ripening season must be dry and warm. Much wheat is destroyed every year by a **disease** called "rust." This disease is fostered by damp.

Wheat could not be grown successfully in some parts of India, such as Bengal. It flourishes in the Punjab and United Provinces as a "winter" crop, water being supplied by irrigation canals. Very satisfactory conditions for growth are provided by the central parts of Canada and the United States, the plains of Argentina, Australia, southern Russia, France, Hungary and Italy. Britain grows only a quarter of the wheat required by her people. This is raised mainly in the eastern part of England, where the rainfall is 20 to 25 inches per year.

No other crop is raised in so many countries. Wheat is ripening in one land or another in every month of the year.

The other grains are not quite so important. They include maize

and the millets, which require a warm climate; barley, oats and rye, which are plants of a hardy type.

Great Millet and **Spiked Millet** are food crops in India. They are *dry* crops, being able to thrive where rice would perish. Durra (Great Millet) is also grown as a food crop in Central Africa.

Maize was cultivated by the "Red Indians" before the white man went to America; it is often called "Indian Corn." Introduced into Europe, it found the Mediterranean climate too dry and that of Britain and northern lands too cold; but it grows well in Rumania. In Africa it is grown along with Durra, and as "mealies" is a favourite native food. Large quantities of maize are grown in the United States, Mexico, Argentina and Australia. In Mexico it appears as the chief grain food; in the States it is used partly as a human food, but largely for the feeding of animals.

Barley is a very hardy plant, grown in most wheat-producing lands. It was formerly much in use as a bread grain; now it is grown mainly for making malt to be used in the brewing of beer. **Oats**, more easily grown than wheat, is found in northern Europe and Scotland where wheat cannot be ripened. It is also raised on a large scale in Canada and New Zealand. **Rye** grows well in poor soil and under poor climatic conditions. It is grown over wide areas in the European plain, especially in Germany and Russia, where it takes the place of wheat as a bread grain.

Grains are the principal foods of the more advanced peoples. Amongst the primitive peoples of the torrid zone, their place is taken by foods obtained with much less trouble. Such foods are sago, manioc and yams, coconut and breadfruit. Sago is used in the East Indies, manioc in the Amazon region and Malaya, coconut, breadfruit and yams in New Guinea and the South Sea Islands.

Sago is obtained from the inner pith of the sago palm. The tree grows in moist places along the banks of rivers in the Malay Peninsula and the adjacent islands.

Manioc, from which tapioca is made, is a native of Brazil. Its tubers contain poisonous juice which is got rid of by heat and pressure. The meal then made is a staple food of the natives of Brazil. Much tapioca is now made in the Malay States, where the manioc is grown as a cover to young rubber trees. The yam is a tuber of a plant belonging to the same family as manioc. The

breadfruit tree is a native of the South Sea Islands, but it is now also grown in tropical America. Its large round fruit is baked in hot embers. The inside then looks like bread, but it has little flavour.

The **coconut palm** is said to supply human wants more fully than any other tree. Its wood (porcupine wood) is used for rafters and ridge poles; its leaves for roofing and mats. The young nut gives milk and the white flesh is food; the shell makes drinking-cups; and the outer fibre, coir for ropes, brushes and matting. The white flesh, broken and dried in the sun is known as **copra**. This, exported to Europe and America, yields **coconut oil** for the making of nut-butter or margarine and soap.

"The coconut palm needs a hot climate, and it grows best in a sandy soil near the sea. It flourishes in the South Sea Islands, Fiji and Ceylon, and is also grown in Malaya, India, Jamaica, Trinidad and British Honduras. All of these are connected with the trade in coir and copra. Ceylon has a special trade in "desiccated coconut."

The **potato** is an interesting and most useful plant. The part used as food is an underground tuber. The potato is easy to grow; it gives a large return; and it can be grown under various climatic conditions—from the higher valleys of India to the Arctic regions. It was discovered in the high Andes by early explorers. It spread slowly in Europe at first. Now it is grown in all parts of the continent and in lands peopled from Europe, and it is used daily as a food.

Under the head **pulses** come a number of plants which produce seeds inside a pod. The seeds have a high food value. They are particularly useful to people who do not eat meat. **Peas** and **beans** are grown in all parts of the temperate zones; but some varieties of beans require a warm climate. **Gram (or Chick Peas)**, lentils and soya beans thrive in a warm climate. Gram and lentils are grown extensively in India and Mediterranean lands, partly for home consumption and partly for export to northern Europe. Soya beans belong more to the east—to Cochin China, Java and Japan. But they have been introduced into India and China, where they are now grown on a large scale. **Ground nuts** are the tropical equivalent of the pulses. The plant pushes its pods into the earth. This is an important crop in India, especially in Madras, and also in Gambia

(West Africa). Ground nuts are now grown in the United States over some 2,000,000 acres of land, and they are known there as pea-nuts. The oil crushed out of them has a special value for lubricating delicate machinery such as watches.

Two thousand years ago **sugar** was unknown. Five hundred years ago it was a luxury. Now it has become almost a necessity. People are consuming more sugar to-day than ever before. During the last thirty years the amount manufactured has more than doubled.

Until about a hundred years ago, sugar was obtained chiefly from the **sugar-cane.** This plant is still an important source of supply, but large quantities of sugar are now made from the sugar-beet and the maple, and smaller quantities from the date and other palms. The sugar-cane and date palm belong to hot lands, the beet and maple to cool lands.

The **sugar-cane** is a gigantic grass plant, growing to a height of 10 or 15 feet. It requires a hot damp climate, and its original home was probably Bengal. It is cultivated all along the shorelands of Asia, from the Indus to the Yangtse, and in Java and other East Indian islands.

Long ago the sugar-cane was introduced into the warm parts of the Mediterranean region. Then the Spaniards took it into the New World, and by the nineteenth century the West Indies had become one of the chief sugar-producing regions in the world. Brazil and the Guianas also produce large quantities. The sugar-cane has also been introduced into Queensland, into both East and West Africa, Madagascar and Mauritius.

Beet-sugar has proved a serious rival to cane-sugar. A German chemist discovered that the juice of the beet contains sugar. About the end of the eighteenth century beet-sugar factories were started in Silesia and Bohemia. By degrees the industry spread into nearly every European country, Turkey and Scandinavia being exceptions.

During the latter half of the nineteenth century the beet-sugar industry was supported by "bounties." These are sums of money paid to manufacturers to enable them to sell their goods at a profit, in face of severe competition. In about twenty years European factories increased their production from 200,000 tons to 2,000,000

tons. At the beginning of the present century Germany alone was making 2,000,000 tons. At the present day beet-sugar is produced in large quantities in the European plain—from France to Russia—and also in the United States. The industry is now making steady progress in Great Britain.

The leaf of the **tea** shrub and the fruits of the **coffee** tree and **cacao** tree are used in making beverages used daily by many peoples. All these plants require warm summers and a fair amount of moisture. The tea plant is the most hardy, and the cacao tree the most delicate of the group.

The **tea plant** grows wild on the hills of Assam. This was probably its original home, but the plant was first cultivated in China. Tea planting was started in India in 1853 and in Ceylon about fourteen years later. In each case the industry has made very good progress.

The tea plant requires regular rainfall during the summer. It must be grown in well-drained ground, because the collection of water about its roots is injurious. Soil rich in vegetable matter and containing some iron has been found most suitable.

The chief tea-producing areas are Assam, several parts of the Himalayan region, the Nilgiris, Ceylon, China and Japan. Tea is grown on a smaller scale in Burma, Java, the United States, Brazil and Natal.

The **coffee plant** also requires a soil rich in vegetable matter, and a climate that is moist and warm, but not excessively hot. Young coffee trees require protection, and they are often grown in the shade of the banana. The original home of the coffee plant is believed to be Abyssinia. From there it was taken across the Red Sea to Arabia. The Dutch transplanted it to Java and Ceylon, and later on plantations were made on the eastern side of the Western Ghats. The Spaniards started coffee plantations in Brazil and Central America.

All these except Ceylon are still important coffee-growing lands. Brazil produces more than half of the coffee used in the world. It is grown on a smaller scale in West Africa, and other parts of Africa.

When the Spanish leader Cortes conquered Mexico, he found that the people (Aztecs) used a red beverage which they called cocoa. This they prepared from the beans or seeds of the **cacao tree.**

Cortes sent cacao beans to the King of Spain, and the beverage, cocoa, soon became popular in the country; it is used to-day as much as ever it was.

The cacao tree requires a very warm climate, plenty of moisture, and very deep soil. Like coffee, it is injured by much exposure to the direct rays of the sun. It is often grown in the shade of rubber trees, which require similar climatic conditions. The chief cocoa producing areas are equatorial lowlands—the Gold Coast and Nigeria in Africa, Brazil, Venezuela and Ecuador in South America, and the islands of Trinidad, Tobago and Sao Thome. Smaller quantities are produced in Mexico, Jamaica, Ceylon and Java.

Raw materials used in various manufacturing processes are obtained from both plants and animals, and from climatic regions of every type. **From** the cold northern forests come **pelts** of the black fox, sable, beaver, stone-marten and others. They are collected by Red Indian trappers for the Hudson Bay Company, and by Siberian nomads for the markets of Russia and Germany.

Wool and hair are provided by the sheep, goat, alpaca, camel and yak. Sheep are reared on a large scale in the grasslands of Argentina, Australia, New Zealand and Central Asia. Asia Minor and Kashmir have long been famous for the rearing of goats. The Angora goat of Asia Minor yields a valuable fibre, mohair. The Kashmir goat and the yak have in winter a soft under-coat which forms excellent material for weaving into soft fabrics. The alpaca of the Andes region, and the camel of the old world desert borders also provide hair which is woven into cloth.

The valuable fibre **silk** is obtained from the silk-worm, which is largely reared in China, Japan, India, Italy and France. Mulberry leaves form the chief food of the silk-worm, so the production of silk is limited to regions in which the mulberry will grow well. In Assam, the Central Provinces and other parts of India, silk is also obtained from " wild " moths. This is known as tussore silk.

Useful **vegetable fibres** are numerous. The principal ones are cotton, jute, flax, hemp, ramie or China-grass, and kapok. Tobacco may also be classed as a fibre plant.

Cotton is a tropical or sub-tropical plant. It requires a moderate amount of rainfall in the early part of the season, with several

months of hot dry weather leading up to the time of picking. The cotton plant is grown in a large number of countries. The most important are the United States, Brazil, Peru, Egypt, the Sudan, Nigeria, India, China, Central Asia and Queensland.

Jute requires a warm moist climate, but **flax** and **hemp** have a wide range. All are grown in India, and in the case of jute Bengal is the chief producing area in the world.

It should be noticed that many vegetable fibres are known to traders as "hemp." True hemp is the inner bark of a plant that

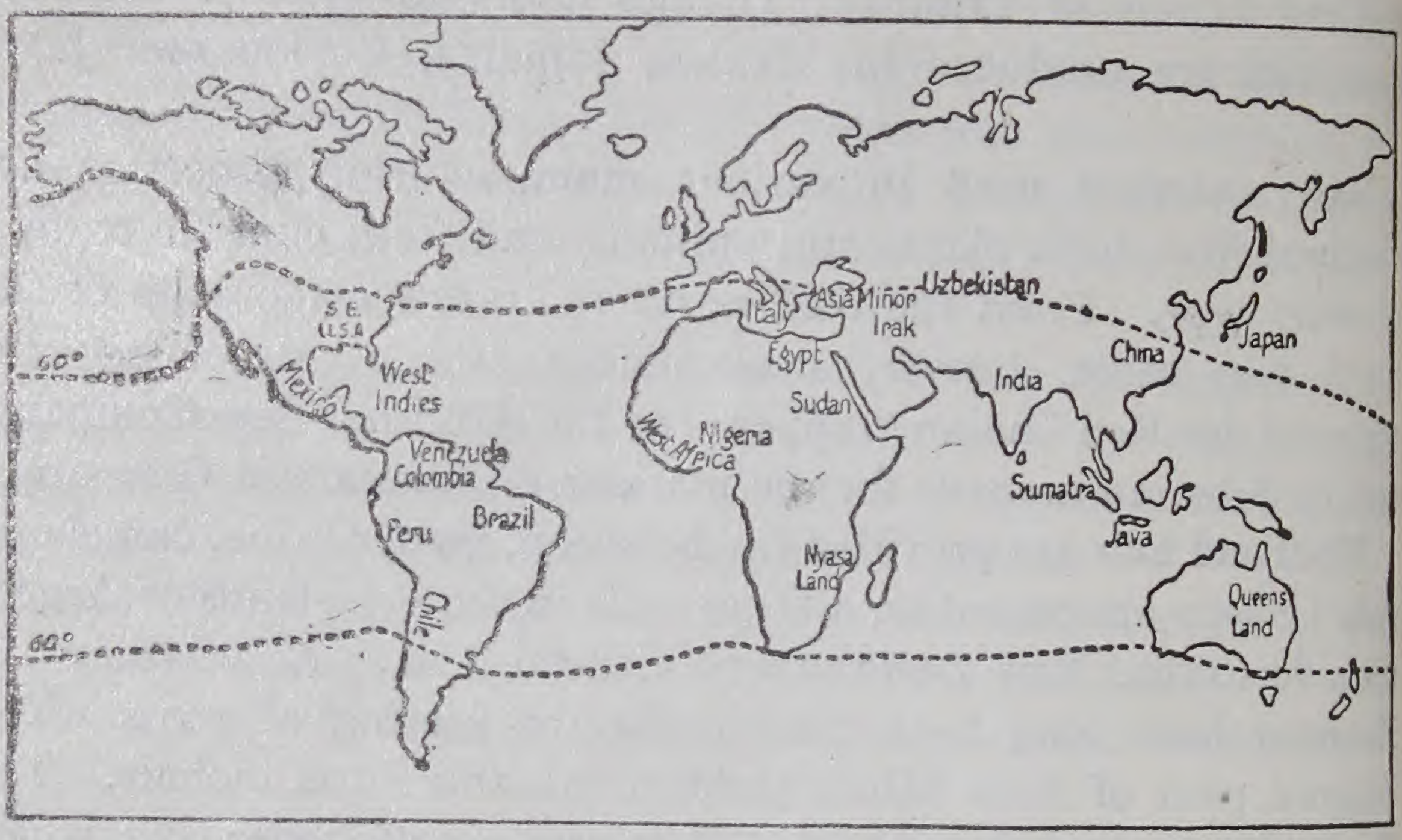


FIG. 59.

Cotton-growing countries of the World are named in the above outline map. It will be noticed that cotton-growing is practically confined to that belt of the earth between annual isotherms of 60°.

belongs to the nettle family. **Sisal hemp** or henequen is obtained from the leaves of a species of agave. It is grown in Florida, Cuba, the Bahamas, Central America and other lands. **Manila hemp**, prepared from the leaf-sheaths of a species of banana plant, is grown mainly in the Philippines. All varieties of hemp are used for making ropes and coarse canvas, but in India the plant is grown more for the sake of the stimulants it yields.

Ramie, or **China grass**, and **Kapok** from a species of silk-cotton tree, are other useful fibres grown in India, China and the East Indies.

Rubber is a product of regions with hot wet climate. It is obtained from lianas and trees which grow wild in the basins of the Amazon and the Congo. But in these areas plantations have also been established. Another important producing region is the Malay Peninsula. Rubber is also grown on a smaller scale in some of the East Indian islands, in southern India and in Ceylon.

Dyestuffs are obtained from logwood and other timbers, and also from madder and indigo, which are cultivated in south-west Asia and India. The demand for these has greatly diminished, because large quantities of dyestuffs are now made from substances obtained from coal-tar.

Timber is raw material of a very important kind, but it was discussed in the chapter on vegetation.

EXERCISES

1. What conditions are required for the cultivation of wheat, rice, and millet? Name countries in which they are grown on a large scale.

2. Write notes on "copra," saying what it is, how it is prepared and for what purpose it is used. Name regions that produce it on a large scale.

3. Make out a list of raw materials, under headings, according as they come from hot, cool or cold regions. Opposite each write the names of one or two countries producing the material on a large scale.

XVII. CITIES AND TOWNS

From the earliest times human beings have chosen to live in groups. Even in the Stone Age parties of men would band together to build villages, and unite in beating off attacks of other groups or of wild animals. Perhaps in each village there would be smaller groups doing different kinds of work—hunting, fishing, repairing houses, making pottery and implements. Thus they would learn to depend one upon another, and to help each other. Each would value the labour and society of the rest.

For such reasons and many others of which early man knew nothing, people have clustered in villages, towns and cities in later

times. Each town has its builders, bakers, doctors, teachers and so on. Each person is doing the work for which he is, or ought to be, best fitted.

Towns do not arise by chance. They grow, most often slowly, sometimes quickly, in places where there is work to be done. It is easy to understand the rapid growth of towns on a gold-field. When the discovery of the precious metal is announced, there follows a mad rush of people from far and near, all eager to make a fortune.

About thirty years ago, thousands of gold-seekers struggled over a snowy waste to Klondike in North America. Many more people followed, to make profit by supplying the wants of the miners. Soon there was a large collection of huts and sheds. This was the beginning of the town called Dawson, the capital of Yukon. At one time its population numbered 20,000. Now it is a town of about 4,000 people.

Johannesburg, the gold-mining centre of Transvaal, also started as a miners' camp. Huts and tents were erected on a gold-bearing ridge called Witwatersrand. Johannesburg has prospered greatly. It is now a stately town of 250,000 people.

Kimberley, the South African diamond centre, Ballarat, Coolgardie and Kalgurlie, gold-mining centres in Australia, and Tatanagar, the steel-making centre in India, are also towns which grew through the discovery of mineral wealth.

On examining a map it will be seen that there are many riverside towns. There are several reasons for this. The river provides supplies of water for domestic and industrial purposes and for irrigation. It also serves as a convenient means of transport. In addition, land near a river is generally fertile ; it will grow food for a large population. Riverside towns are very numerous in northern India.

The most important riverside towns are situated either (*a*) at the confluence of two rivers, or (*b*) where the river is crossed by a road or railway, or (*c*) at the head of tidal navigation—that is, the highest point that ocean-going vessels can reach.

Ailahabad (Ganges-Jumna), and St. Louis (Missouri-Mississippi), are good examples of confluence towns. They control waterways in three directions. St. Louis is the greatest river-port in the world. Its great river traffic has made it the focus of roads and railways.

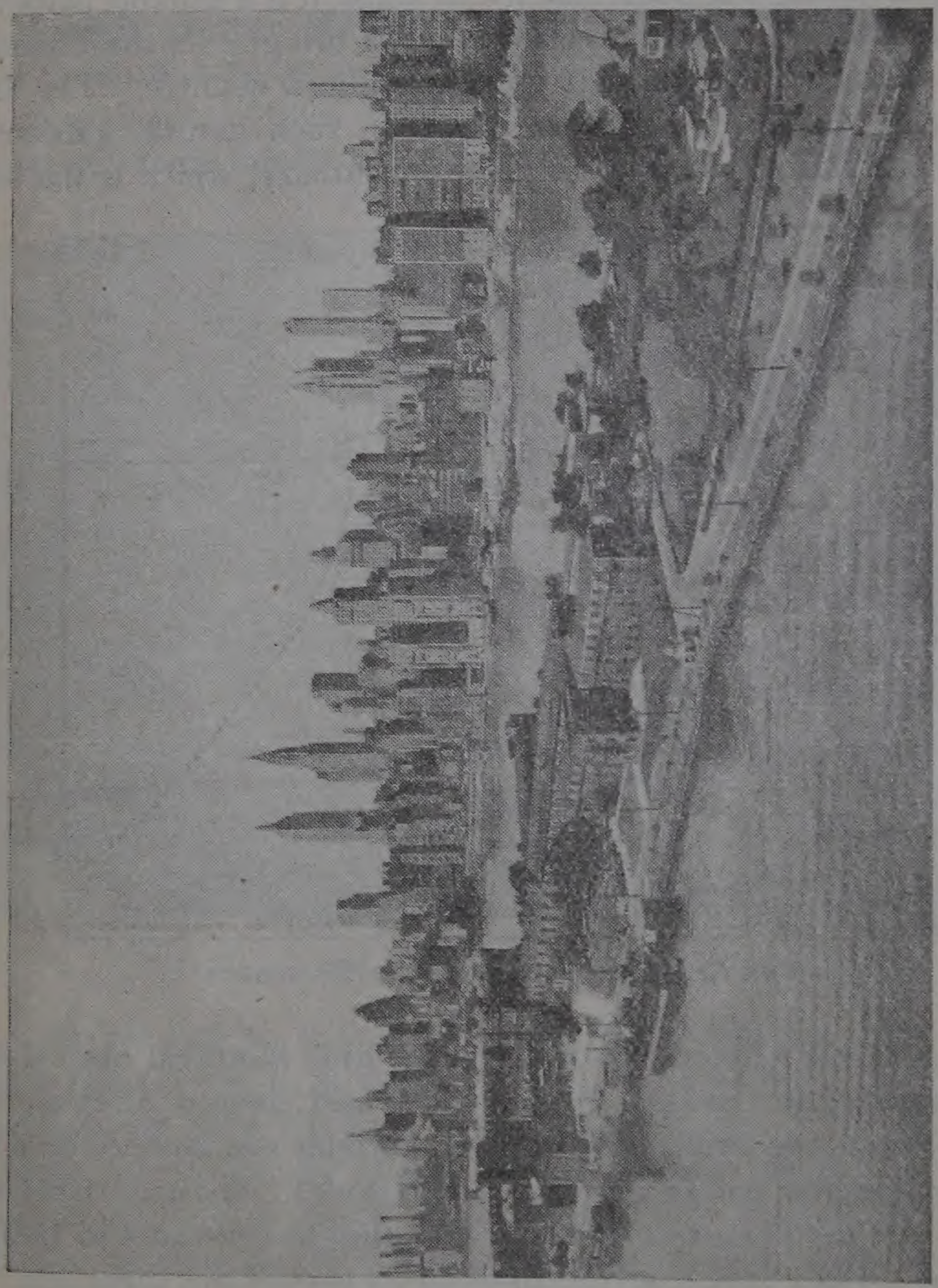


FIG. 60.—NEW YORK.

Generally, the largest town in a province has become so because it is the most convenient centre in the province.

Sea-ports are focus towns of a special kind. They are the meeting-place of land routes and sea routes. A port will not develop unless there are land routes converging upon it. The west coast of the United States extends for 1000 miles with but a single port. This is San Francisco, situated beside a break in the mountains which border the coast. New York, Beirut, and Bombay are also ports which owe their prosperity to gaps in the mountains behind them. (Refer to Figs. 96 and 100.)

Hinterland is a convenient term for the country served by a port. The port is the **outlet** for the products of the hinterland, and the inlet for goods the hinterland does not produce. The kind of trade at any port depends upon the kind of work done by the people of the hinterland. Karachi exports mainly agricultural produce, Calcutta agricultural produce and manufactured articles. Liverpool, the port of a great industrial area, exports manufactured articles and imports large quantities of food and raw materials.

Ports often suffer through the silting up of their waterways. Many towns on the Hooghly above Calcutta have lost trade from this cause. Dredging is resorted to in order to maintain a good channel.

Industrial towns were mentioned in a previous chapter, but there are other points to notice. Amongst the requirements of the manufacturer are raw materials and power. Industrial towns grow near the source of supply of one of these. With steam-driven machinery the source of power is coal. At the present day therefore most of the great industrial towns are on or near to a coalfield. Manchester, Blackburn and a large number of other cotton manufacturing towns are near the Lancashire coalfield of England. They are mostly situated in valleys so that they have a constant supply of water. The raw cotton used in these towns is brought from America, Egypt, and some of the American colonies.

Tatanagar in India is a good example of the growth of a town into a great industrial centre. The discovery of iron ore in Bihar and in Orissa led to the erection of blast furnaces and steel works in a rather barren tract of land. Not far away there is limestone for use in smelting, and stores of manganese for making steel. The growth

of the town is largely due to the enterprise of the Tata Iron and Steel Company.

EXERCISES

1. Make sketch maps showing the situation of the following: Allahabad, Karachi, Cairo, Shanghai, Montreal, Sydney. State what factors have influenced the growth of each city.

2. What conditions favour the growth of a sea-port? Name three large ports and say why they are important. Name three ports which have declined, giving reasons for their loss of trade.

XVIII. MAP-READING

Most of the earth's surface has been surveyed for the purpose of making maps. Mountains, valleys, trees, buildings and other features, are represented on maps by certain symbols. If we know

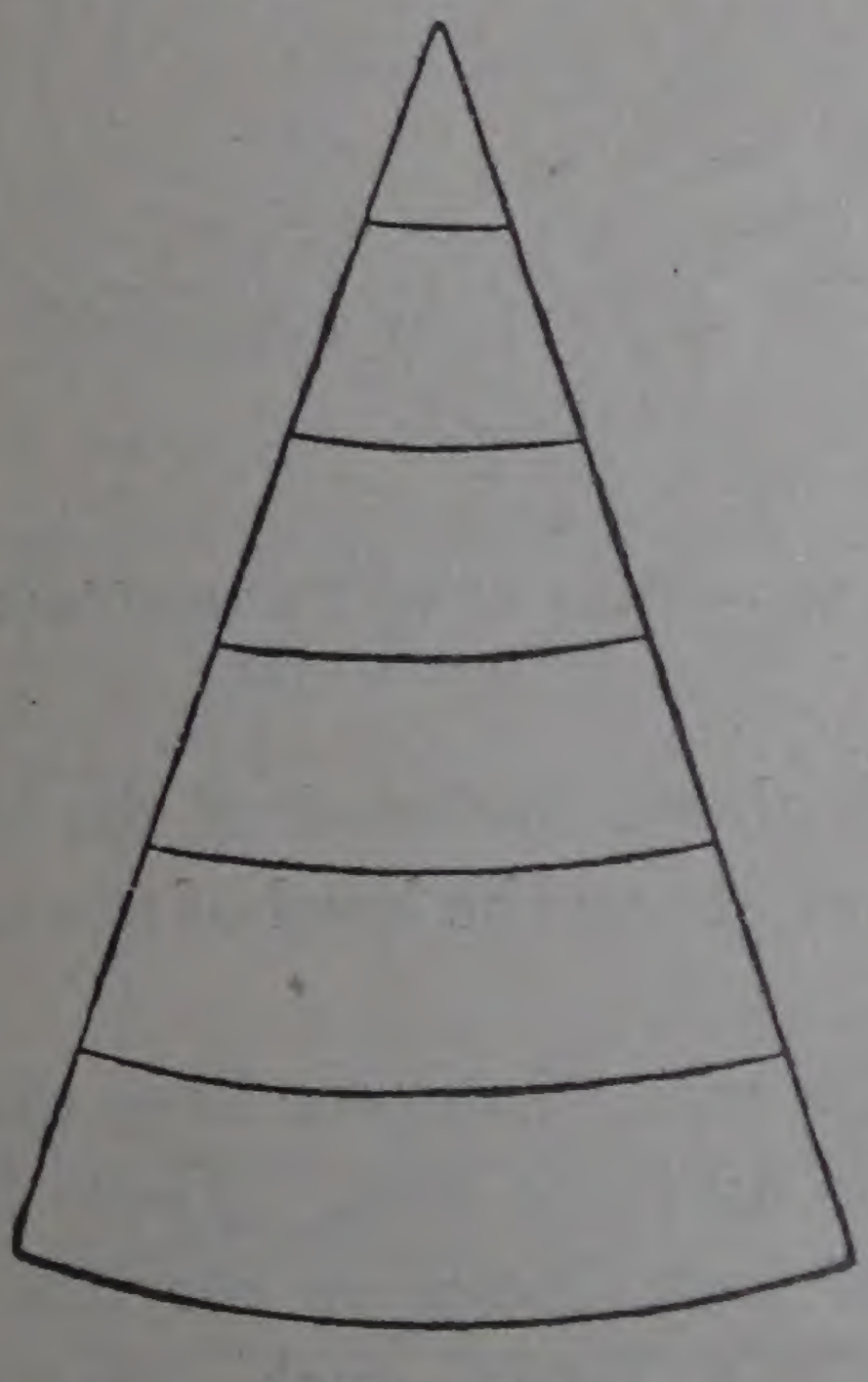


FIG. 63.

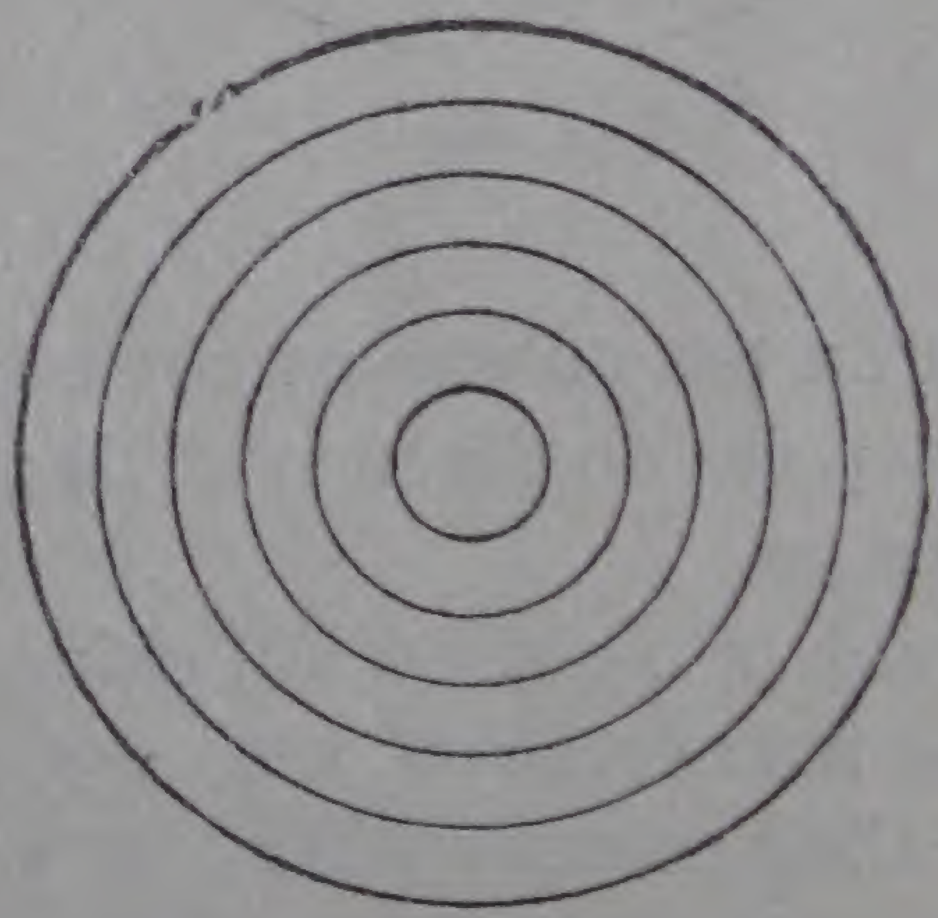


FIG. 64.

these symbols we can *read* a map. A good map enables us to picture a country we have never seen.

On ex[illegible] an Indian Survey map, you will find a list of symbol[illegible] trees, buildings, railways, etc. We shall here consid[illegible] is indicated.

Surface relief is generally indicated by means of **contour** lines. What these are will be made clear by a simple experiment. Take a wooden cone about 6 inches high, and nail a thin sheet of lead to its base. Place the cone in a deep dish. Pour water into the dish to the depth of one inch. Now draw a line round the cone along the surface of the water. Next, pour in more water until the depth is 2 inches, and draw a second line round the cone. Repeat the operation again and again, until you have lines round the cone at levels, 1, 2, 3, 4, and 5 inches (Fig. 63).

Now place the cone on the table and look down upon it. You see the lines you have drawn as concentric circles (Fig. 64). Every

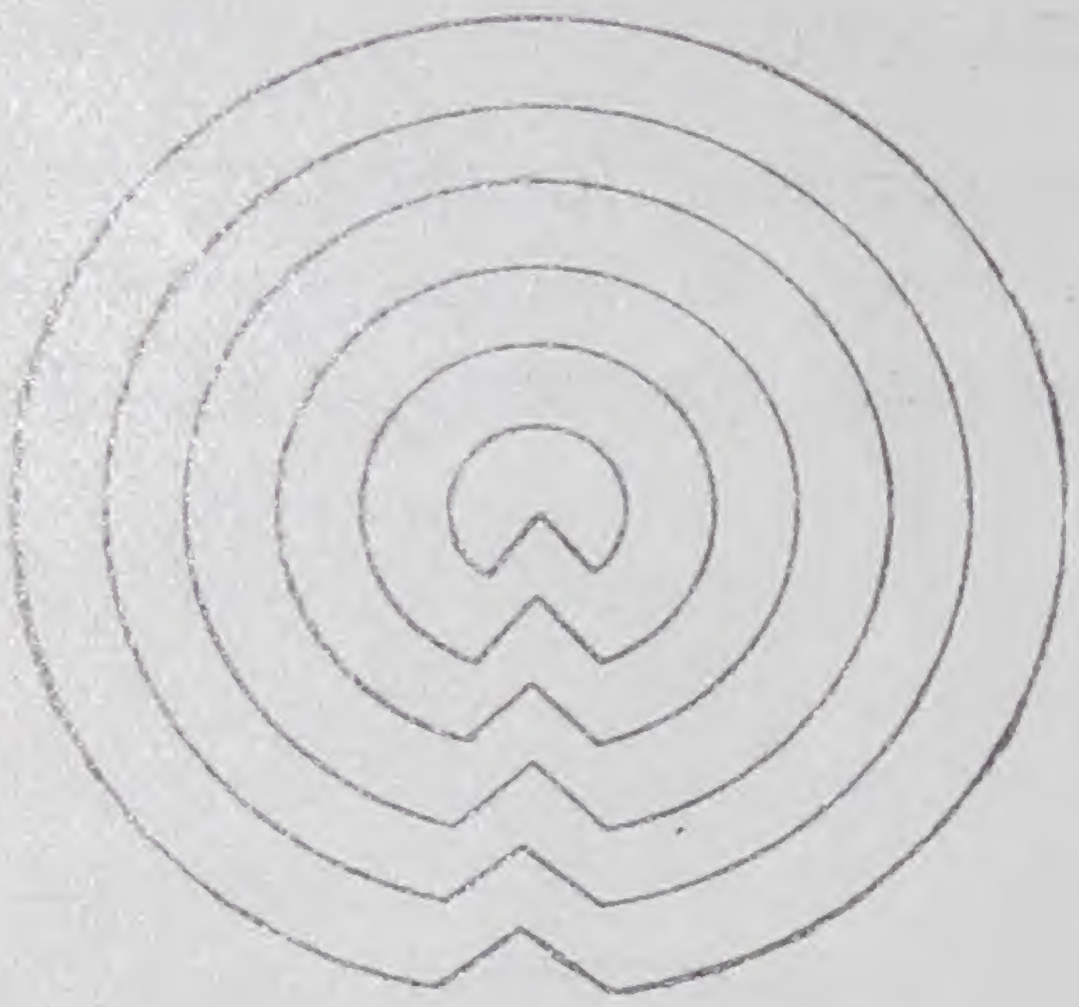


FIG. 65.

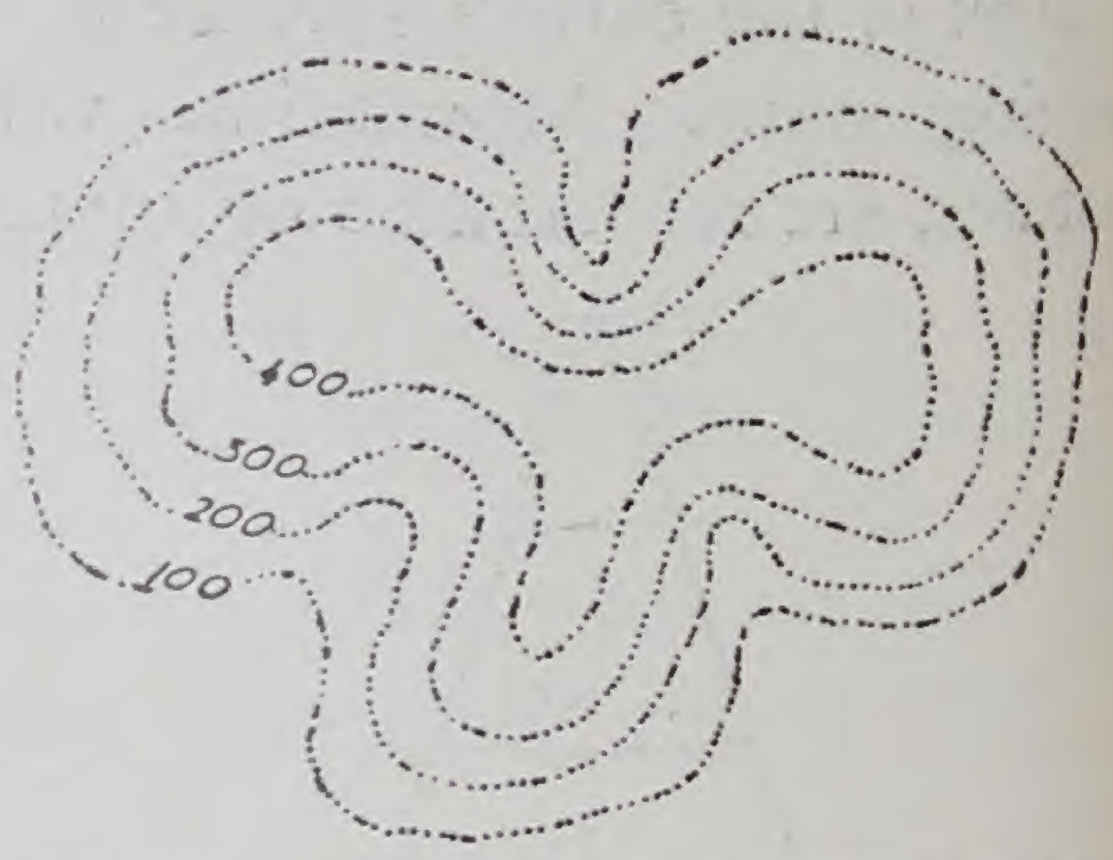


FIG. 66.—HILL WITH THREE VALLEYS IN ITS SIDES.

point on the outermost circle is 1 inch above the level of the base. Every point on the next circle is 2 inches above the level of the base, and so on.

Think of a conical hill rising from the sea. Imagine lines drawn round it at levels of 100, 200, 300, 400 and 500 feet. These lines are called **contour lines**. If you could look down on the hill you would see them as concentric circles. A set of such concentric circles on a flat sheet represents a conical hill.

Make a groove in the side of the cone, and repeat the experiment. The result will be as shown in Fig. 65. A groove in the side of a hill is called a valley. Therefore on examining a map, we can distinguish valleys by the *inward bend* of the contour lines. A bulge in the side of a hill would be represented by an outward bend in the contour lines (see Fig. 66).

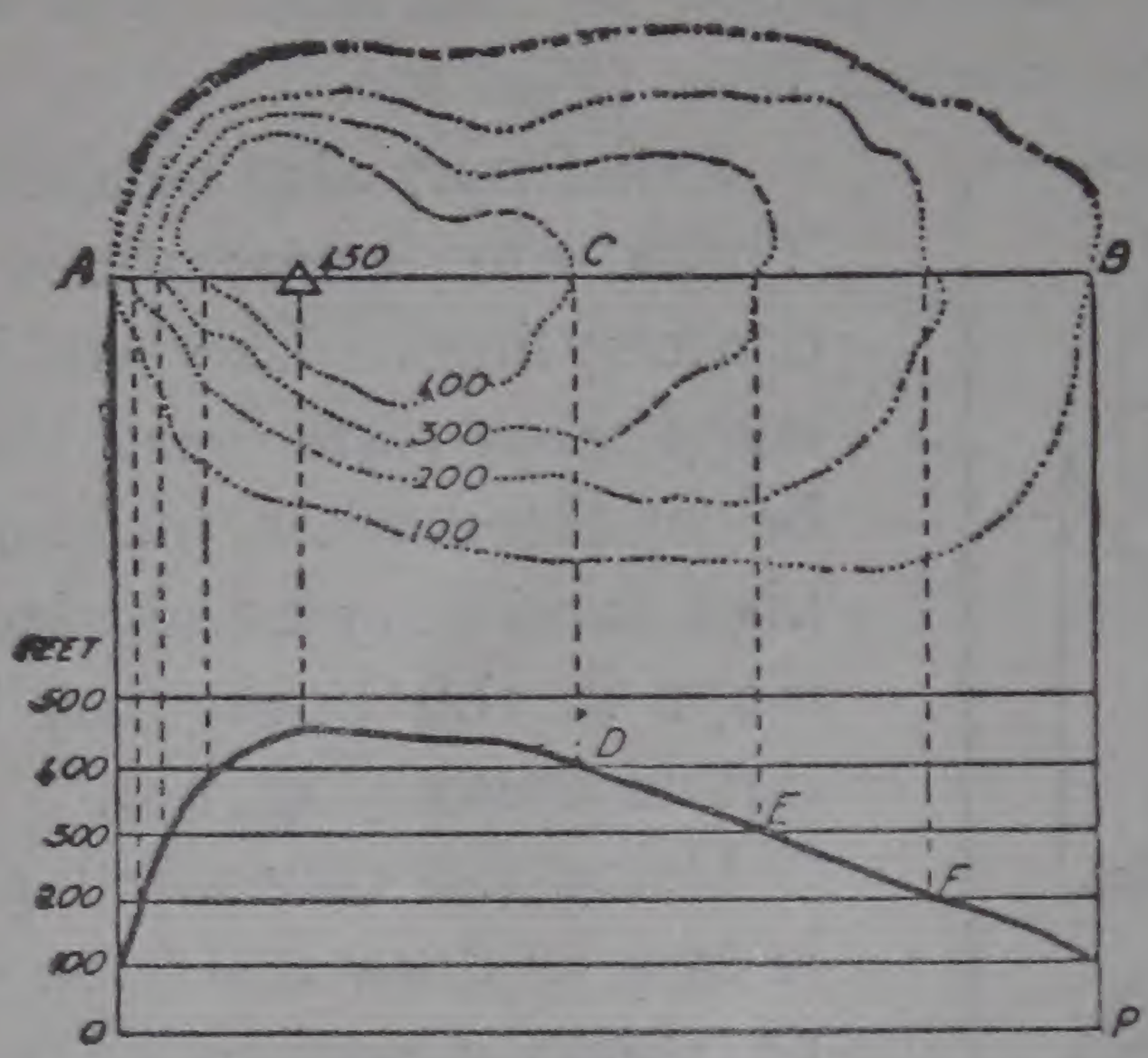


FIG. 67.—HILL WITH ONE SIDE STEEPER THAN THE OTHER.

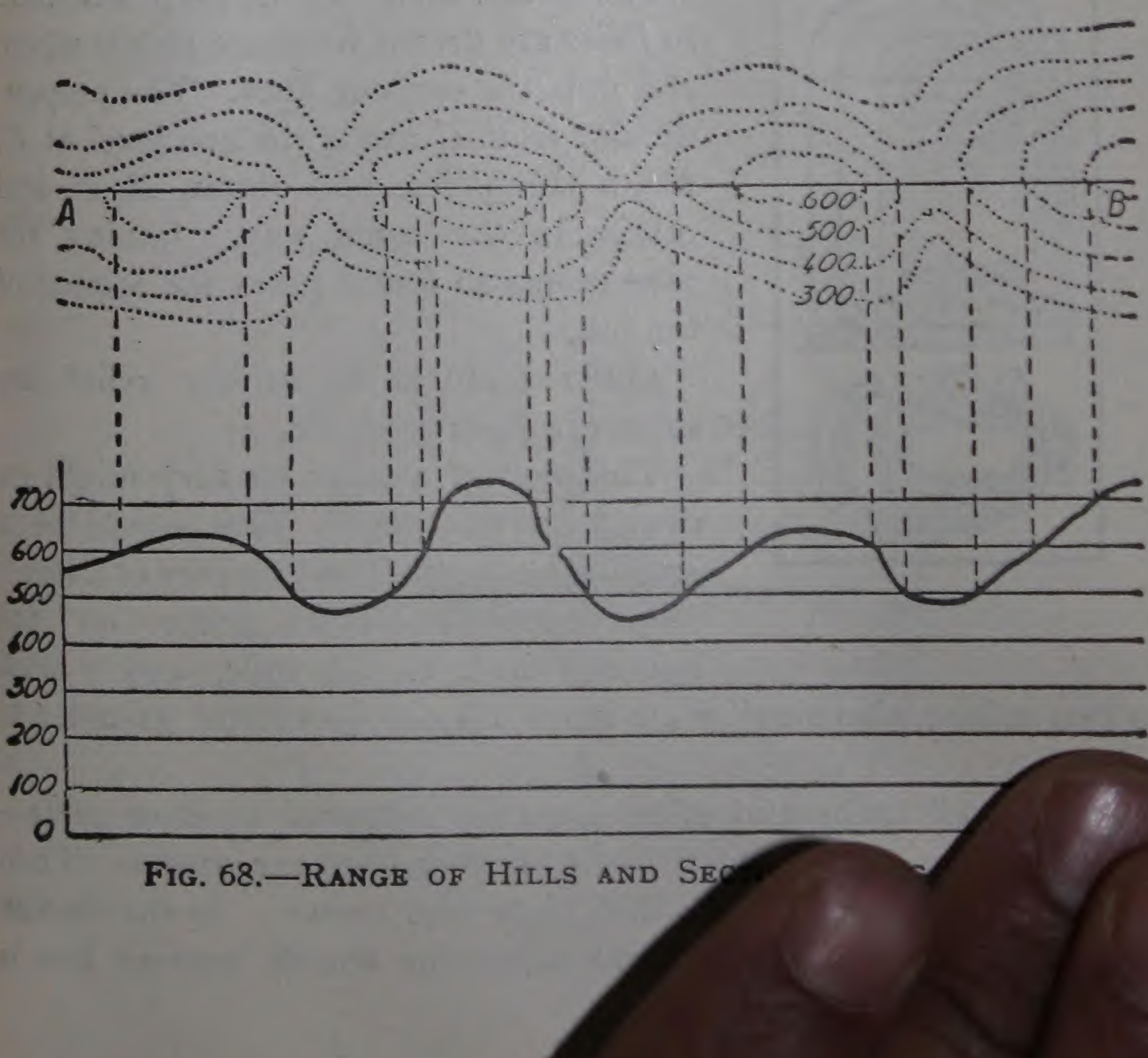


FIG. 68.—RANGE OF HILLS AND SEC

If one side of a hill is steeper than the other the contour lines on the map will be closer together on that side. The steeper the slope the closer are the contour lines (Fig. 67).

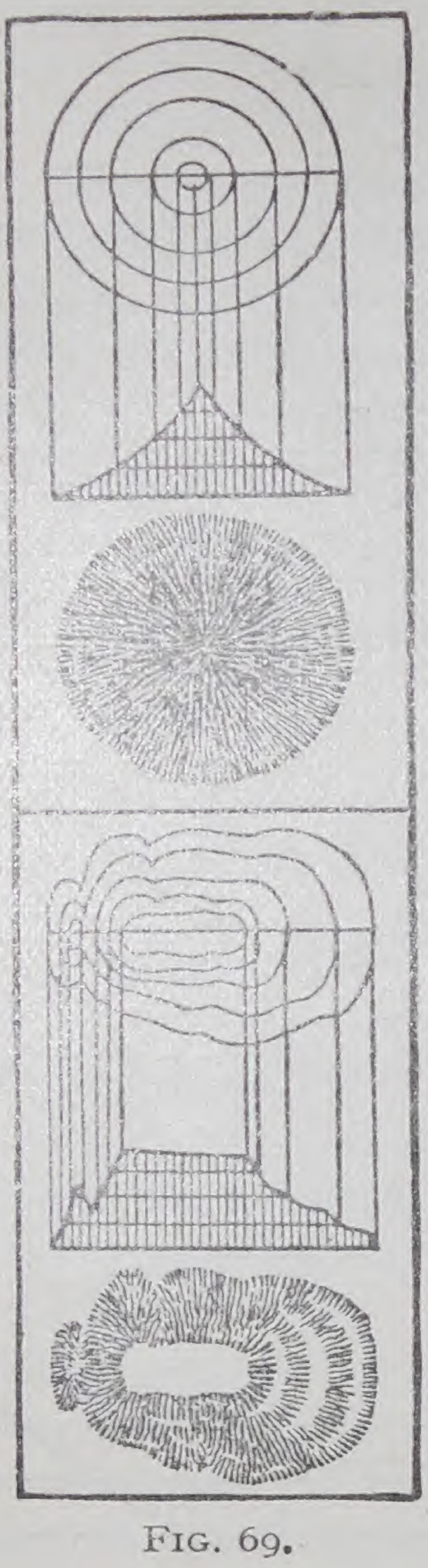


FIG. 69.

Relief may also be shown by hachures. These are stream-lines drawn across contour lines. Lowland is almost white, steep slopes are very dark. This may be imitated when making sketch maps; high land may be shaded, or, as in the maps in this book, may be indicated by dotted areas (Fig. 69).

Using the contoured plan of a hill, it is easy to draw a section or profile. Fig. 67 shows a section of a hill, along the line *AB*. The method is as follows:

A base line *OP* is drawn. Then lines are drawn parallel to *OP*, to mark levels 100, 200 etc. feet. Next, perpendiculars to these are drawn from the points where *AB* cuts the contour lines. The perpendicular from *C* meets the 400 level at *D*. Mark this point, and obtain *E*, *F*, and others in the same way. Joining the nine points so found gives the section of the hill.

Other features in surface relief are shown in figures 68, 70, 71.

The map of a large country might be drawn on this page. That would be a small-scale map. The "Survey of India" Department publishes maps on the scales 1 inch to the mile, and 1 inch to two miles; also small scale maps 1/1,000,000th and 32 miles to 1 inch.

Many wall maps and atlas maps are coloured to show surface relief. When making such maps contour lines are drawn. Then low land is coloured green, and high land brown. In the *Indian School Atlas*, for example, land below the 600 ft. contour line is

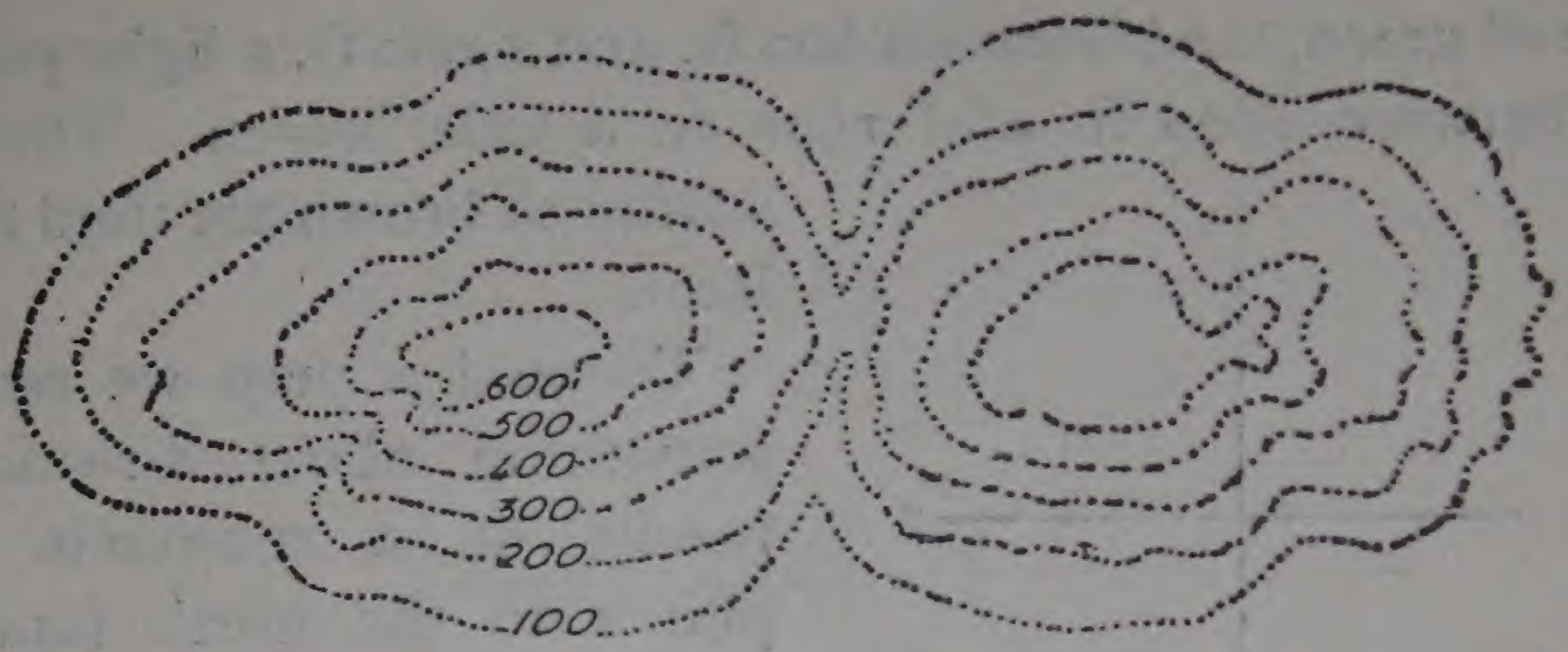


Fig. 70.—Hill with Two Peaks, and a Pass between them.

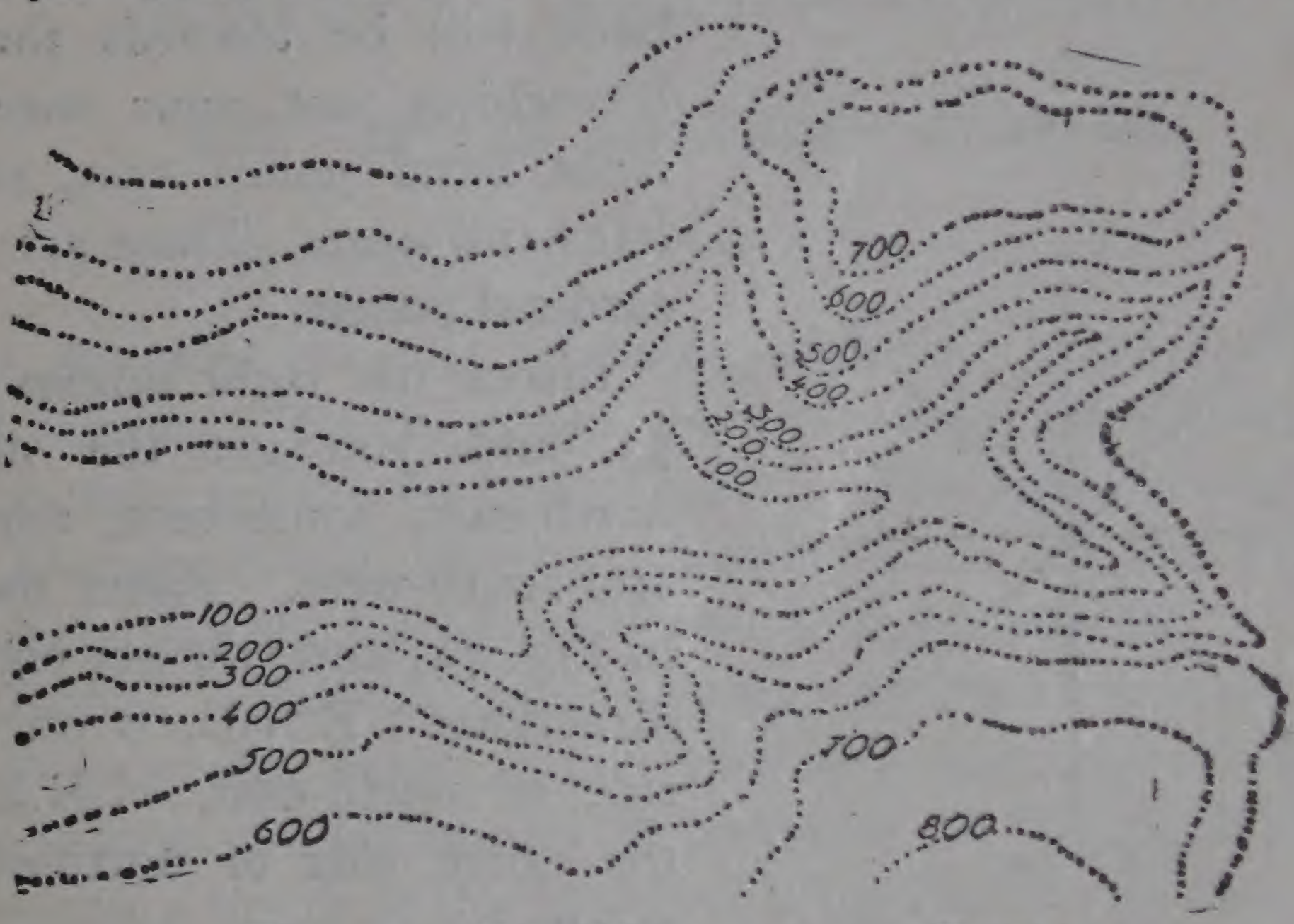


Fig. 71.—The Valley of a River.

Fig. 72.—The Points of the Compass.

SECTION II

SURVEY OF THE CONTINENTS

XIX. SOUTH AMERICA—PART I

I. SURFACE RELIEF AND RIVERS

South America consists of three highland regions and three lowland regions. The highland regions are (*a*) the Andes, (*b*) the Brazil plateau, (*c*) the Guiana plateau. The lowland regions are, (*a*) the Orinoco basin, (*b*) the Amazon basin, (*c*) the Plate river basin—including the Paraguay, Parana, and Uruguay.

The Andes. This mountain system consists of a series of lofty ridges, huge peaks, basin-shaped plateaux, and lines of volcanoes. It extends from the isthmus of Panama to the island of Tierra del Fuego—with a break at the Strait of Magellan—a distance of 5000 miles. The lowest ridge, the Coast Range, borders the Pacific shores. Its southern end is partly submerged, and thus there is a chain of islands along the coast of Chile.

The Andes stretch north along the border of Chile and Argentina as a single ridge as far as Aconcagua. This peak towers 23,000 feet above the Uspallata Pass. Under the pass there is a tunnel for the trans-Andine railway. From Aconcagua there is an Eastern Range and a Western Range. They diverge to the extent of over 150 miles, enclosing the basin-shaped plateau of Bolivia. In the middle of the plateau lie a number of lakes, receiving the drainage from the ring of mountains. One of them, Titicaca, is the largest lake in South America. It is overlooked by two peaks, Sorata and Illimani, each over 21,000 feet high. Not far away is La Paz, capital of Bolivia, 10,500 feet above the sea—higher even than Lhasa.

From the Bolivian plateau three ridges stretch northwards. They

coloured green, land between 600 ft. and 1,000 ft. a light yellow, and land between 1000 ft. and 1500 ft. a pale brown. Then darker shades of brown are used for higher land.

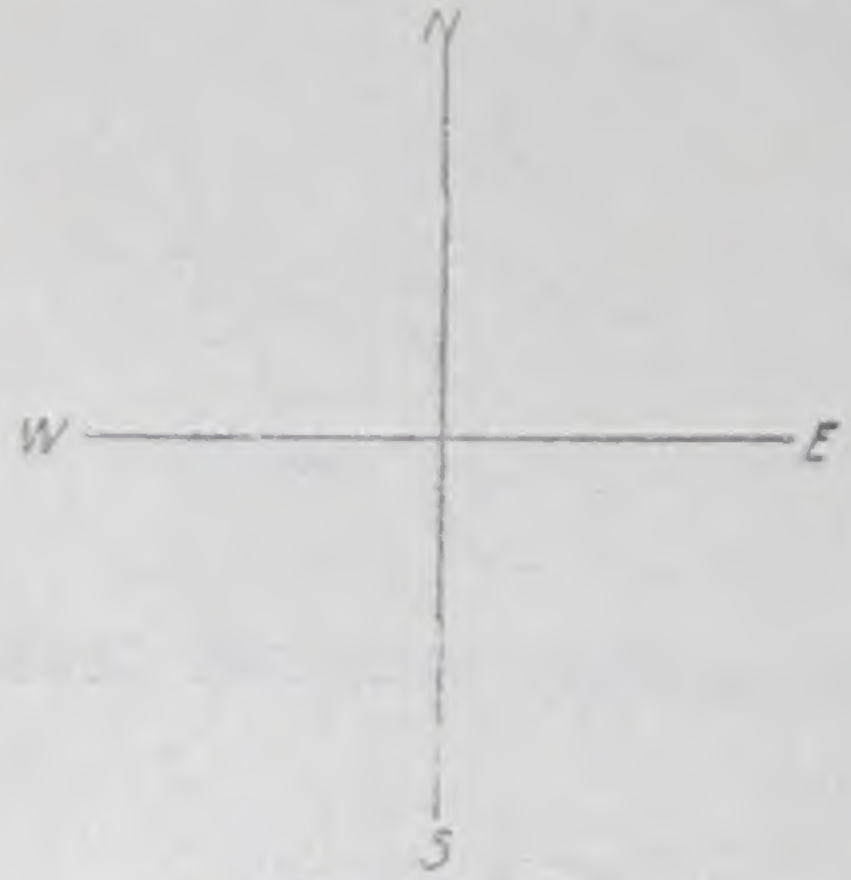


FIG. 73.

To read a map we must know something about direction. The needle of a magnetic compass points to the north (and south). If you stand facing north, your back will be towards the south. Stretching out your arms, your right hand points east, and your left hand west. These are the four **cardinal points.**

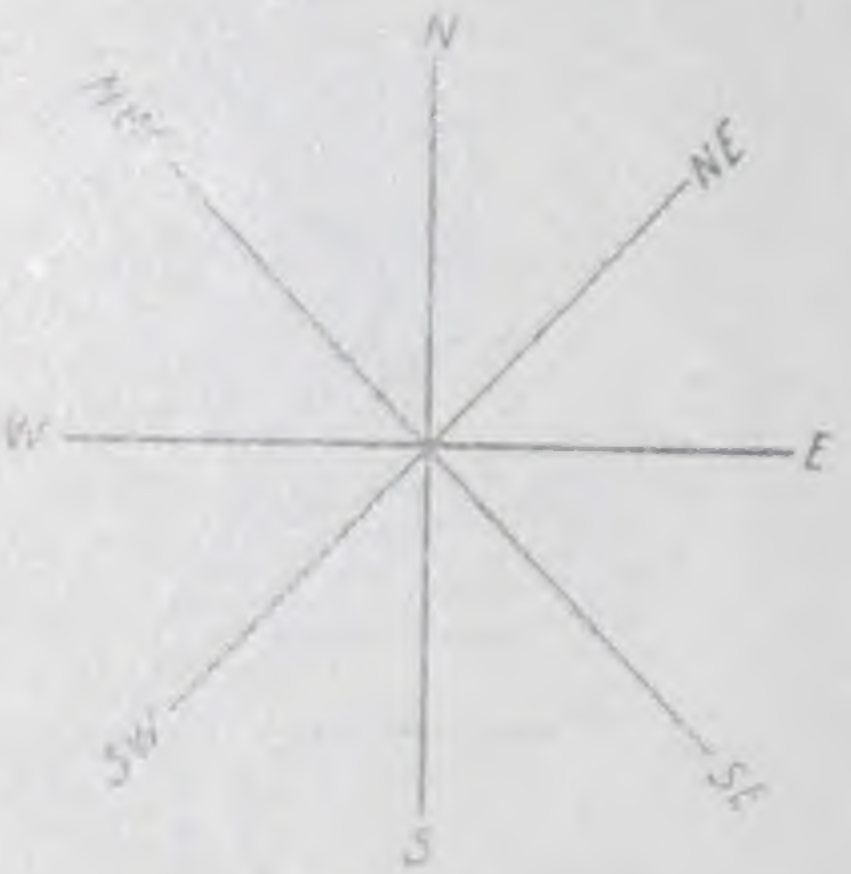


FIG. 74.

Bisect the right angles in Fig. 73, and you get the directions north-east, south-east, north-west, and south-west. Bisect the angles in Fig. 74, and you get eight more directions. E.N.E. is on the east side of north-east, N.N.E. is on the north side of north-east, and so on.

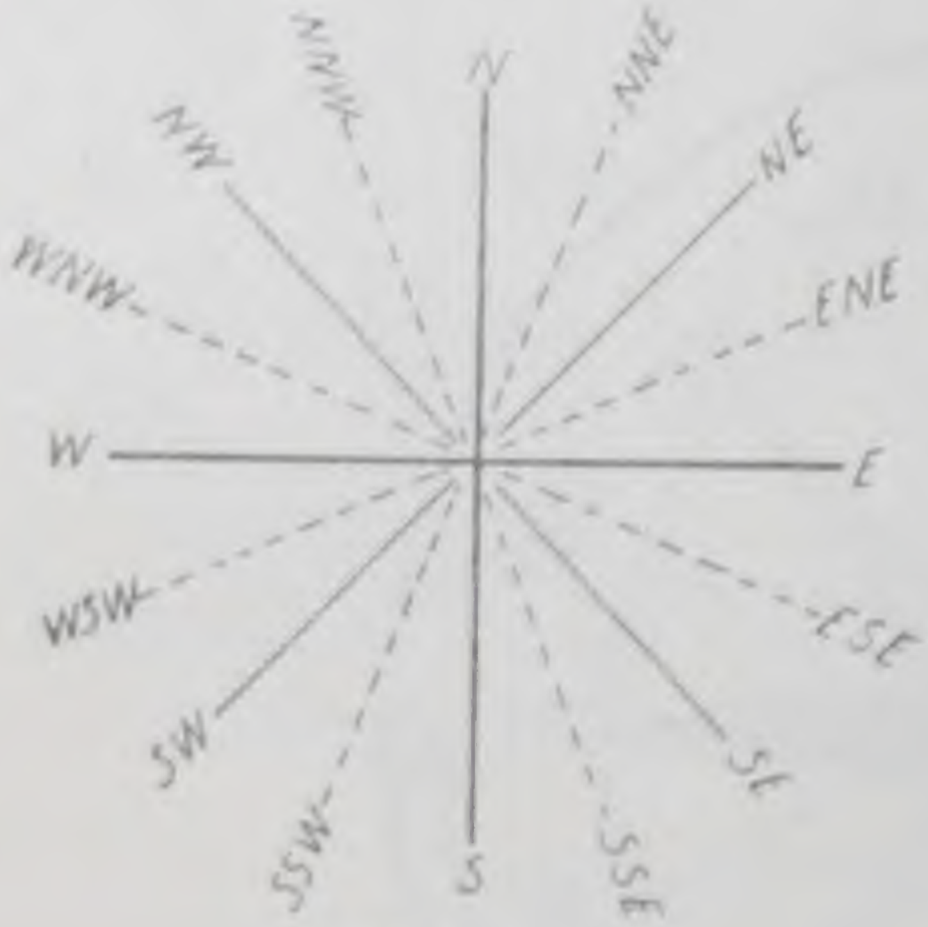


FIG. 75.

EXERCISES

1. Make a contoured map of an area in which there are four hills, situated irregularly.

2. How would you find the four cardinal points (*a*) at noon, (*b*) at 6 a.m., (*c*) at night ?

3. Make a contoured map of a range of hills, and mark the course of a railway, and a road, from one side of the range to the other.

are like the fingers of a hand. Deep forested valleys lie between them, traversed by tributaries of the Amazon.

Farther north is the plateau of Ecuador. It is enclosed by two ridges which meet in a huge knot at Pasto. On the plateau stands the capital Quito, 9000 feet above the sea. The city is near the volcano Cotopaxi (19,500 ft.).

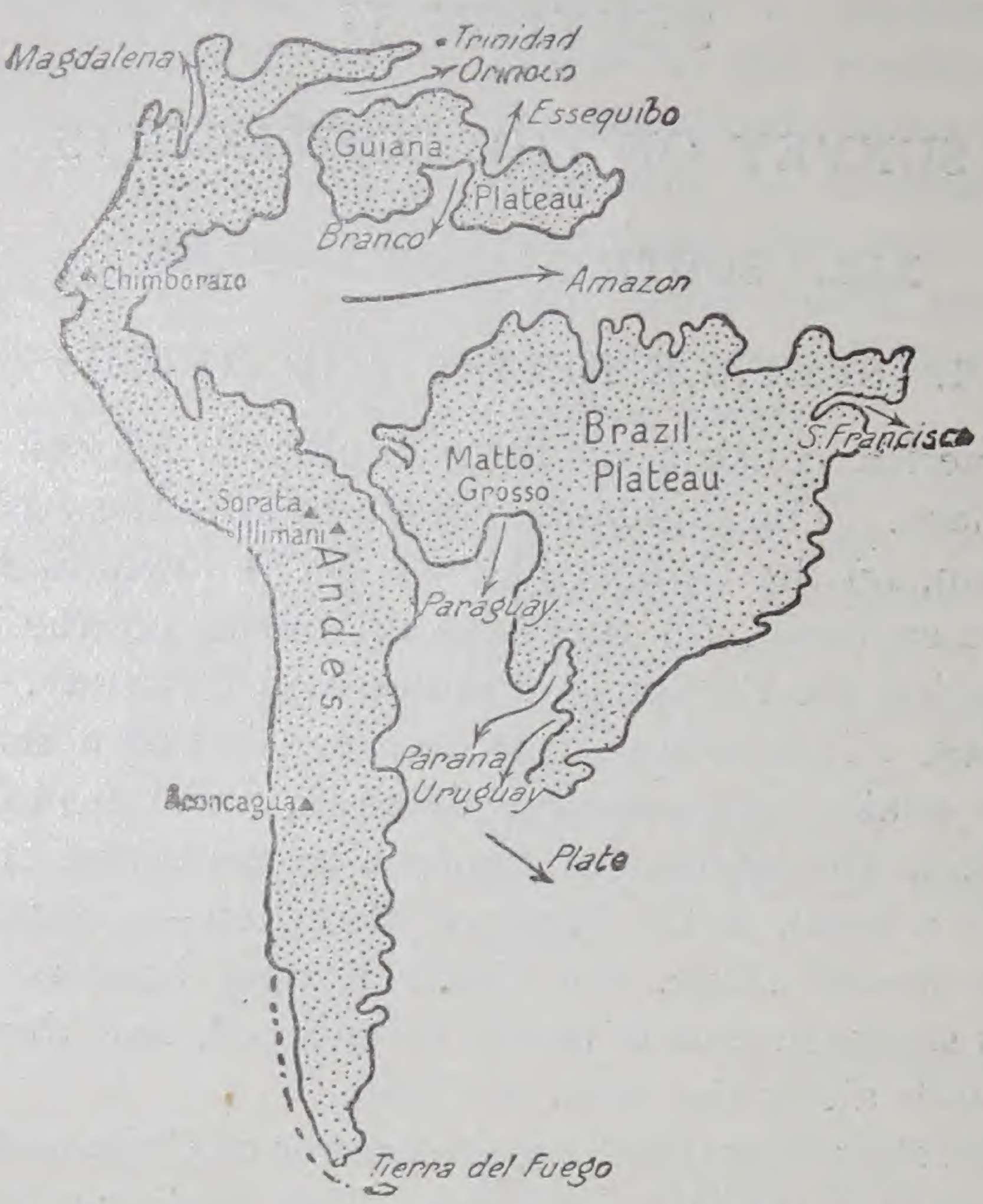


FIG. 76.—PLAN OF THE HIGHLANDS OF SOUTH AMERICA.

From Pasto, again, three ridges run northwards. The Magdalena and its tributaries flow between them. On the eastern ridge there is another capital city, Bogota, also about 9000 feet above the sea. This eastern ridge bends along the coast of the Caribbean Sea, and finally ends in the island of Trinidad.

The Brazil Plateau is a triangular mass with its base almost along parallel 5° S. Its altitude is greatest along the coast near Rio de Janeiro. Here the land falls steeply to the sea. The plateau slopes to the interior. Its northern edge is dissected by feeders of

the Amazon, and by the Sao Francisco, which was probably once a feeder of the Amazon. The south-western edge of the plateau has been deeply cut by the Paraguay, Parana and Uruguay. The Matto Grosso uplands meet the lower slopes of the Andes. The watershed is just high enough to separate the waters of the Amazon and Paraguay.

The Guiana Plateau is an irregular block much dissected by rivers. The Essequibo and the Branco have almost cut the plateau in two. A low watershed connects the Guiana plateau to the Andes. It is not high enough to prevent tributaries of the Orinoco and Amazon from mingling.

All three highland regions are forested at lower levels. Higher up there are large areas of grassland. All the three are rich in

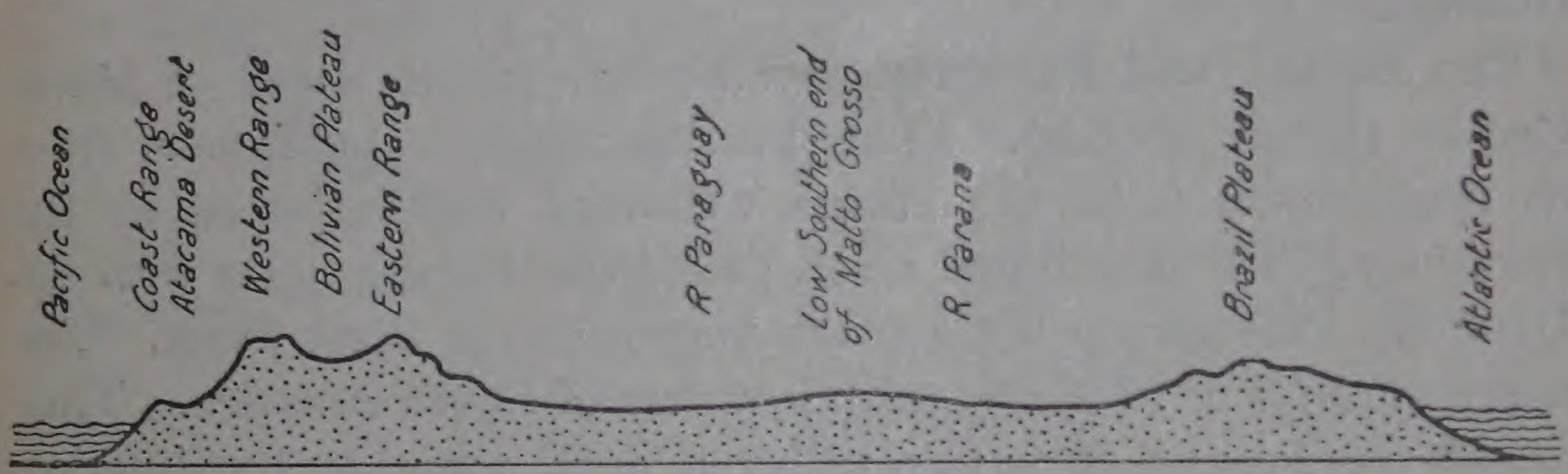


FIG. 77.—DIAGRAMMATIC SECTION ACROSS SOUTH AMERICA IN LAT. 20° S.

minerals. The Andes contain gold, silver, platinum, tin, copper, lead and other ores. Bolivia produces one-quarter of the world's supply of tin. The Andes region also contains supplies of fertilisers. These come from the nitrate fields of the Atacama desert.

Brazil and Guiana yield diamonds, gold and iron ore. Brazil has also some coal, and Guiana some beds of aluminium ore.

The Lowlands. The three river basins are built of rich deep sediment. Both the Amazon and the Paraguay basins were once occupied by the sea. The **Orinoco** flows through Venezuela, along the north side of the Guiana plateau. The first part of its course is through dense forest; the second through savanna land, called **llanos**; and the third through thick mangrove swamps which line the shore.

The Amazon, 3500 miles long, has its sources less than 100 miles from the Pacific. Its head-streams descend from the high Andes

by many waterfalls, and flow through deep gorges into the plain. After the season of heavy rains the tributaries bring down so much water that the country is flooded for many miles on each side of the main river. For most of its course the Amazon flows through dense forests known as **selvas**. Forest spreads up the tributary valleys into the Brazil plateau. The lower Amazon is from 50 to 150 miles wide. The main river and its tributaries provide thousands of miles of waterway. This is very important; swamps and dense vegetation make road construction very difficult. Manaos, on the Negro, 1000 miles from the mouth of the Amazon, is a terminal port of a British line of steamships. But vessels can go almost to the foot of the Andes. It is even possible for boats to pass from the Amazon, along the Negro and the Cassiquiare to the Orinoco.

The **Parana and Paraguay** flow along opposite sides of Matto Grosso (Great Woods). The Parana receives the Iguazu from its magnificent falls, then turns westward and is joined by the Paraguay. The combined river, called the Parana, joins with the Uruguay to form the big estuary known as the **River Plate.** The name reminds us of the Spanish invaders of South America. They found the Parana-Paraguay valley a good route to the interior. They founded Buenos Aires early in the sixteenth century, and shipped much gold and silver (*plata* in Spanish) through that port. The rivers are very good means of transport, and in Argentina there is a good service of steamboats.

Large tracts of grassland occur in the basins of all three rivers. The northern portions are of the savanna type—a mixture of tall grass, thorny shrubs and trees. This is generally called **campo.** The southern portions, on each side of the River Plate are of the steppe type. This is known in Argentina as **pampa.**

II. CLIMATE

South America is crossed by the equator and the tropic of Capricorn. Two-thirds of the continent is in the torrid zone. In January, only Chile and Patagonia lie outside the 70° isotherm. In July, the 70° isotherm almost bisects the continent, and the other isotherms are roughly parallel to it. (Refer to Figs. 80, 84.)

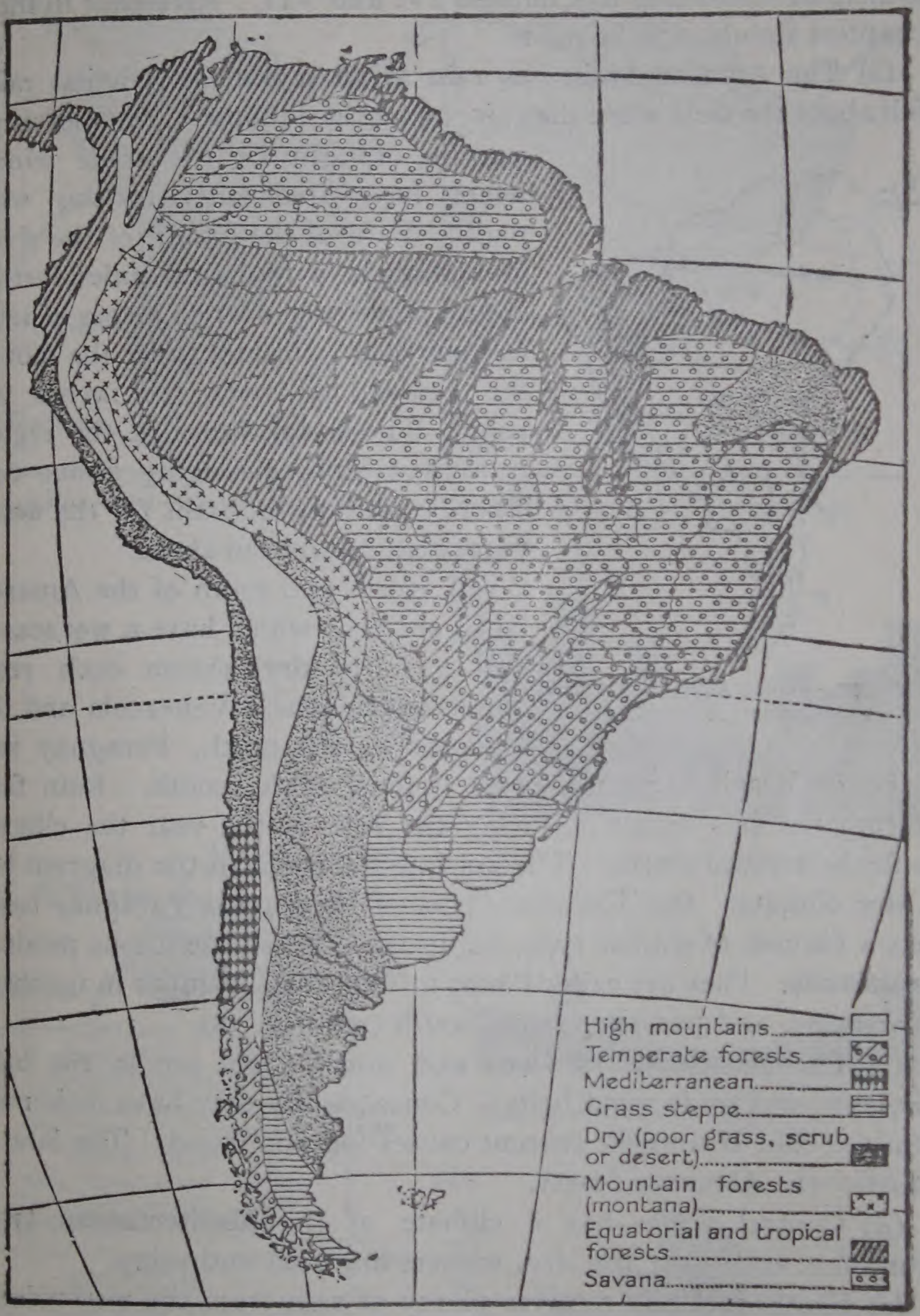


FIG. 78.—NATURAL VEGETATION OF SOUTH AMERICA.

The climates of South America provide good illustrations of the principles mentioned in Chapters IV. and VII. Reference to these chapters should now be made.

(*a*) **The Amazon basin has rain at all seasons.** Heaviest rains fall about the time when the sun crosses the equator. At other times rain is brought by the trade winds, which have free entry to this wide plain. Para at the mouth of the river, and Manaos, a thousand miles farther inland, have each over 80 inches of rainfall per year. Iquitos, near the foot of the Andes, has over 100 inches per year. The temperature of the region is always high, averaging about 80°. These conditions account for the **dense vegetation** referred to above.

FIG. 79.—CLIMATIC REGIONS OF SOUTH AMERICA

(b_1) North and south of the Amazon basin are belts which have a wet season and a fairly dry season each year. These belts include Venezuela and the Guianas in the north, Paraguay and parts of Brazil, Argentina and Bolivia in the south. Rain falls during the hot season; during the rest of the year the climate is fairly dry and warm. The portion marked *x* in the diagram has a dry climate. (b_2) The lower part of the Parana-Paraguay basin has a climate of similar type, but cooler These conditions produce **grasslands**. They are called **llanos** in Venezuela, **campos** in northern Argentina, and **pampas** farther south (see Fig. 78).

(*c*) The shorelands of Peru and north Chile are in the high pressure and trade wind belts. Consequently they have little rain. But the cold Humboldt current causes fog and cloud. The land is desert—the **Atacama desert.**

(*d*) Central Chile has a climate of the **Mediterranean type.** Summers are warm and dry, winters are mild and rainy.

(*e*) Southern Chile receives plenty of rain from the west winds, and the land is forested.

(*f*) But the Argentine side of the Andes is a "rain-shadow" region. It consists of poor steppe-land and the stony Patagonian desert.

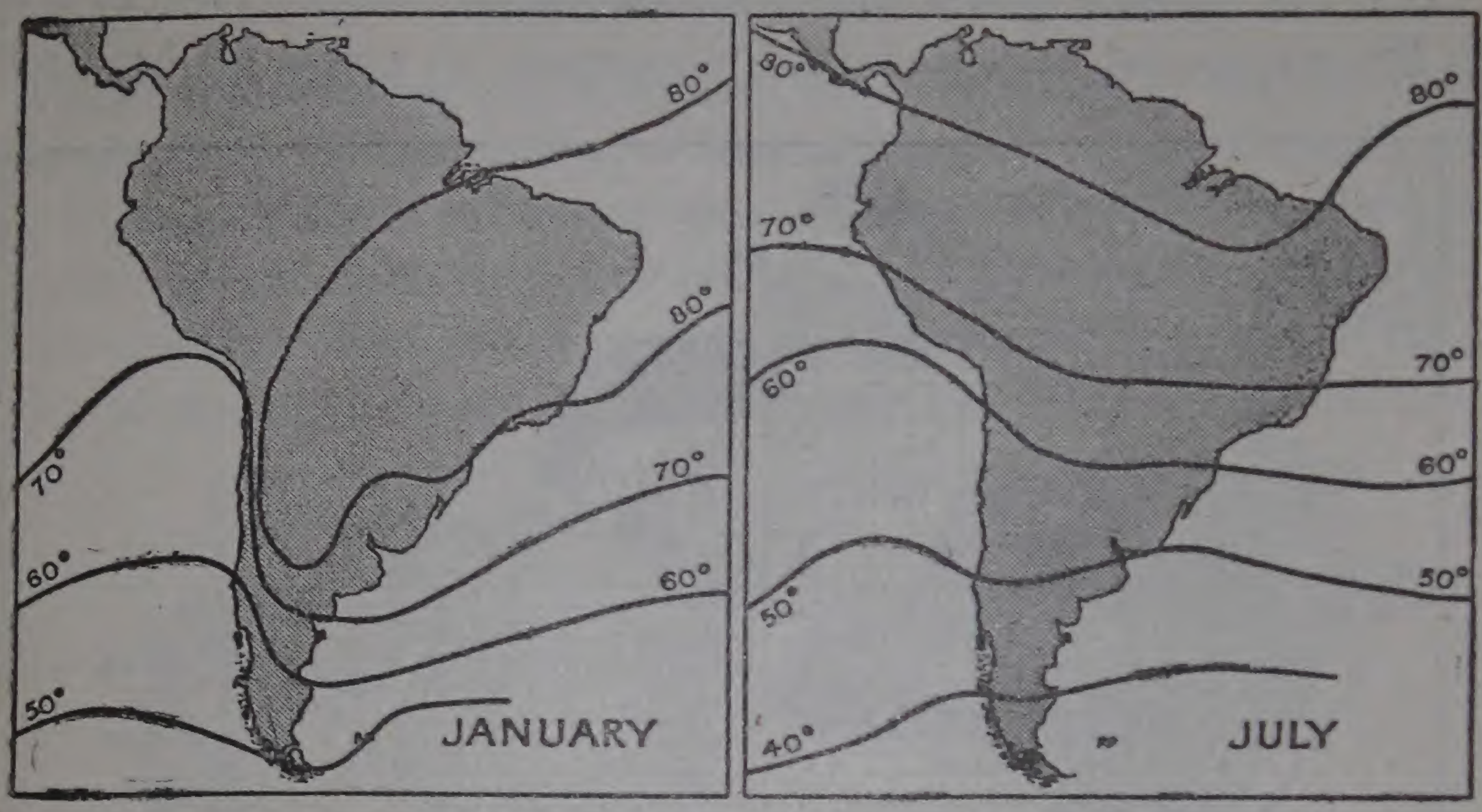


FIG. 80.—SOUTH AMERICA: JANUARY AND JULY ISOTHERMS.

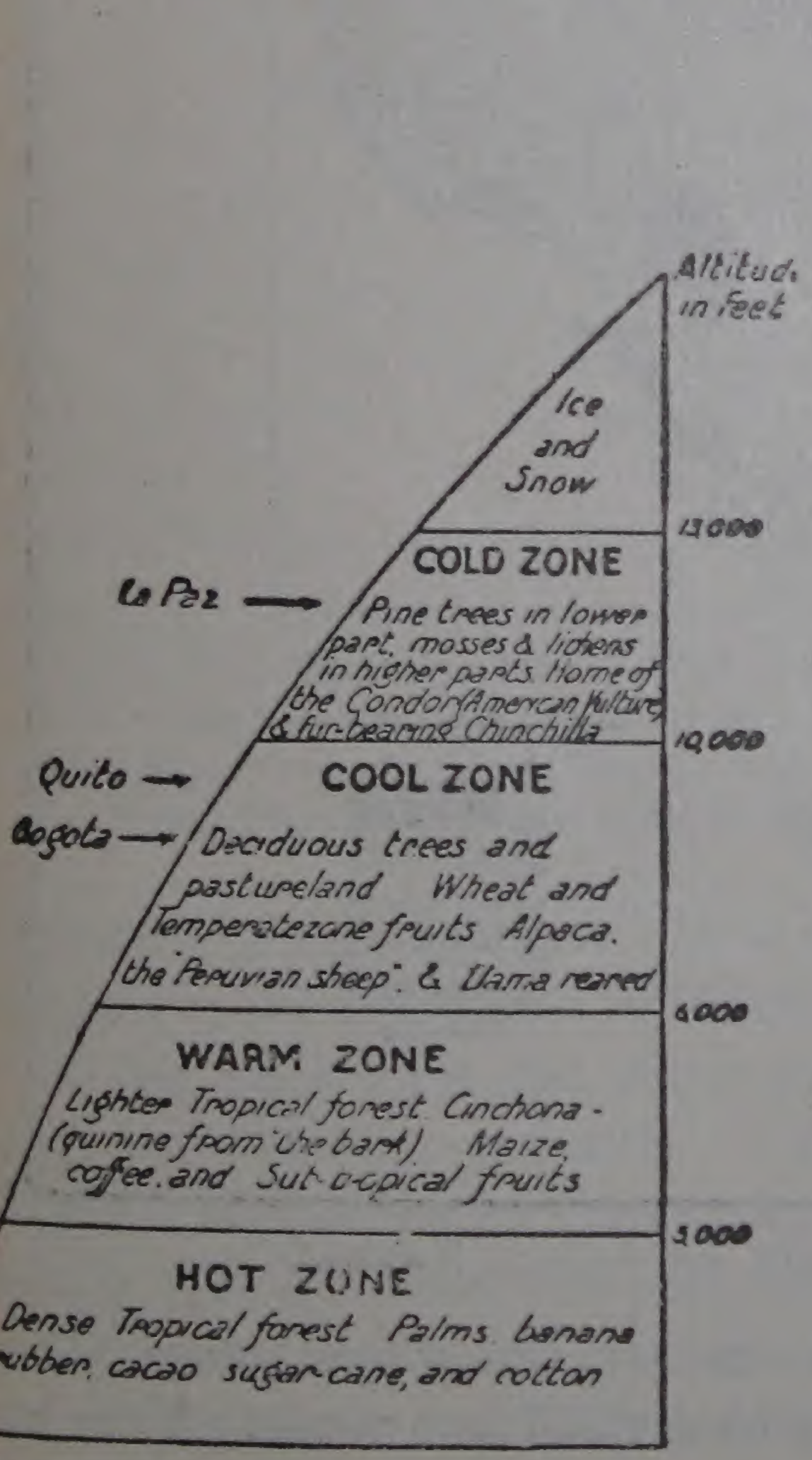


FIG. 81.—THE ANDEAN ZONES.

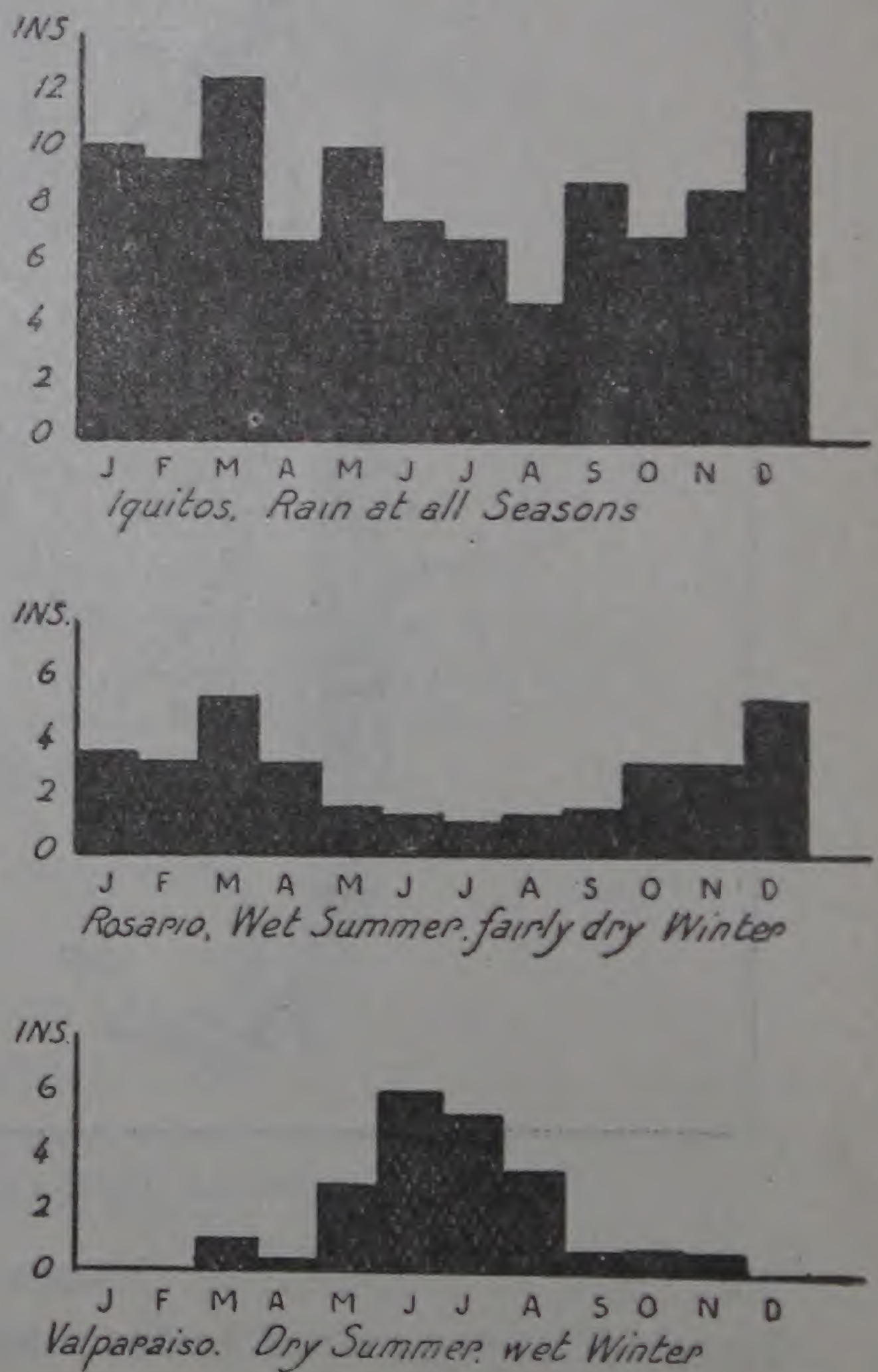


FIG. 82.—RAINFALL CHARTS FOR SOME SOUTH AMERICAN TOWNS.

(*g*) The climate of the Andes region varies from tropical to arctic in the equatorial belt, and from temperate to arctic farther south.

FIG. 83.—ANNUAL RAINFALL OF SOUTH AMERICA.

There are corresponding changes in vegetation and crops. The slopes of the equatorial Andes may be divided into zones. They are distinguished by climate and plant life. These zones are shown in figure 81.

III. THE PEOPLE AND STATES

South America was made known to Europeans in the fifteenth century. The discoverers were Columbus and others from Spain and Portugal. The continent was allotted to these two nations. Portugal received the land now called Brazil, and Spain all the rest.

The continent was thinly peopled by a branch of the yellow race. Many of the inhabitants lived a nomadic life, but there were more

FIG. 84.—TO SHOW THE POSITION OF SOUTH AMERICA.
Notice the situation of the four towns with respect to the Equator and the Tropic. Note also that meridian 60° W. cuts North America only in the east of Labrador.

advanced people in Peru. In a short time, however, all were conquered by the European invaders.

In the early days the white men—particularly the Spaniards—were ever seeking treasure. They discovered the silver mines of Potosi; they obtained much gold and silver from the natives. The wealth they acquired was shipped to Spain.

When the thirst for treasure abated the Spaniards and Portuguese began to establish colonies. In the seventeenth century English and French people settled in Guiana. Shortly afterwards

the Dutch took possession of a part of Guiana. These portions of South America still belong to the three peoples named.

The rest of the continent remained part of the Spanish or Portuguese dominions for about 300 years. During that period the land was being developed. Natives were employed on plantations, but they were not very suitable for the work. Then negroes were imported from Africa to work as slaves. The descendants of the slaves, now free, form part of the population of the northern countries.

At the beginning of the nineteenth century, the South American colonists severed their connection with the mother countries. They formed the republics named below, but the Spanish and Portuguese languages and customs have a firm hold on the peoples.

Republic.	Capital.	Character of the Country.
Brazil -	Rio de Janeiro	Plateau, and plain of the Amazon.
Venezuela - -	Caracas	Orinoco flood-plain and part of Guiana plateau.
Colombia -	Bogota	Andes mountains and valleys and upper Orinoco plain.
Ecuador - -	Quito	Andes mountains and valleys and head-streams of Amazon.
Peru - -	Lima	
Bolivia - -	La Paz	Andean plateau and part of Paraguay basin. No coast.
Paraguay - -	Asuncion	Hills and Parana-Paraguay plain. No coast.
Uruguay - -	Monte Video	Hills and plains.
Argentina - -	Buenos Aires	Parana flood-plain and lower slopes of Andes.
Chile - - -	Santiago	Andean coast range and valleys.
British Guiana -	Georgetown	Part of the Guiana plateau, and coastal plain.
Dutch Guiana -	Paramaribo	
French Guiana -	Cayenne	

To obtain a correct idea of the size of these countries, one should examine a large scale map of the world. Peru and Bolivia are nearly half, and Argentina three-quarters the size of India. Brazil

is an enormous country. Its area is more than double that of India.

Many people from other European countries, especially Italy and Germany, and some from India and China, have found a home in South American states. They have done much to improve agriculture in the countries in which they have settled. But South America is still a thinly peopled continent. Most of the people live near the coast. The most thickly populated parts are near the great ports Buenos Aires, Rio de Janeiro, Bahia and Pernambuco, and Valparaiso. Next come small areas about Bogota and Caracas. None of these has a very dense population. In the interior there are large areas with very thin population, some in the torrid zone and some in the temperate zone. Thus South America forms a field of emigration for the people of all countries.

XX. SOUTH AMERICA—PART II

I. TROPICAL COUNTRIES

Brazil. About half of Brazil is covered with dense forests (selvas), which also extend into the adjoining lands, Venezuela, Colombia, Ecuador, Peru, Bolivia. The climate of the forest region is hot and wet; the vegetation is very luxuriant; and there are large tracts of swampy land. The region is therefore thinly peopled, and it has not yet been thoroughly explored. Rivers provide the best means of communication. The Amazon and its tributaries form some 40,000 miles of waterways.

The development of this region has hardly begun. At present the chief product of the forests is rubber. Natives collect the latex or juice from wild rubber trees. They make it solid under the action of heat and smoke. Boats collect the rubber and carry it to trading stations. Strange as it may seem, there is a modern town, Manaos, in the middle of the selvas, on the river Negro. It is a centre for the collection of forest products. From Manaos rubber goes down the Amazon to Para for export. But ocean-going vessels are able to reach Manaos itself.

The eastern shoreland of Brazil is a region of plantations; it is the most densely peopled part of the country. The chief products

are coffee, sugar, cotton, cocoa, tobacco. Brazil produces about 80 per cent. of the world's coffee. The railway from the collecting centre, Sao Paulo, to the great coffee port, Santos, is known to traders as the "coffee road."

Cane sugar, cocoa, tobacco and cotton are grown a little farther north. Plantations are on the narrow coastal plain, and in the valleys that stretch back into the plateau. Bahia and Pernambuco are the chief outlets of this region.

Pastoral work is very important on the extensive grasslands of the Brazilian plateau. Cattle are the chief animals reared. The Sao Francisco gives access to this region; but there is a waterfall where the river descends from the plateau. A railway joins this point to the coast.

The mineral wealth of Brazil is very great, but not fully worked. Manganese, gold, iron, coal and petroleum are raised; the country also possesses precious stones and aluminium.

Brazil is as yet a land of primary producers, but **industries** are developing. Iron and steel works have been started near the iron-field of Minas Geraes, and there are 240 cotton mills in the country.

Rio de Janeiro, the capital, is a fine city situated on a beautiful bay 15 miles long. It is the chief commercial centre of Brazil, and has a population of 12½ lakhs. The port is connected by railway with the plantation regions, the pastoral region, and the mineral-producing areas, and it is an outlet for all.

British Guiana is the only portion of the mainland of South America in the British Empire. East of it lies Dutch Guiana, and east of that again there is French Guiana. The three colonies are very similar, but British Guiana is most developed.

The country consists of a rather swampy coastal plain, and a plateau dissected by the Essequibo and other rivers. The rivers do not look large upon the map, but they provide over 400 miles of waterway. They are also sources of power not yet utilised. On the Potaro, a tributary of the Essequibo, there is the famous Kaietur Fall. It has a drop of 800 feet over the escarpment of the plateau.

Gold, diamonds, and the ores of aluminium and iron are found in the interior. Cattle are reared in large numbers on the savannas of the plateau. The forests on the plateau provide timber and a kind of rubber called balata. But most of the work of British

Guiana is done on the coastal plain. This is composed largely of sediment brought by the Orinoco and the Essequibo. The soil is very fertile, and the hot wet climate makes the region very suitable for plantation work. Half of the working population is employed on sugar-cane plantations or in work connected with sugar. The

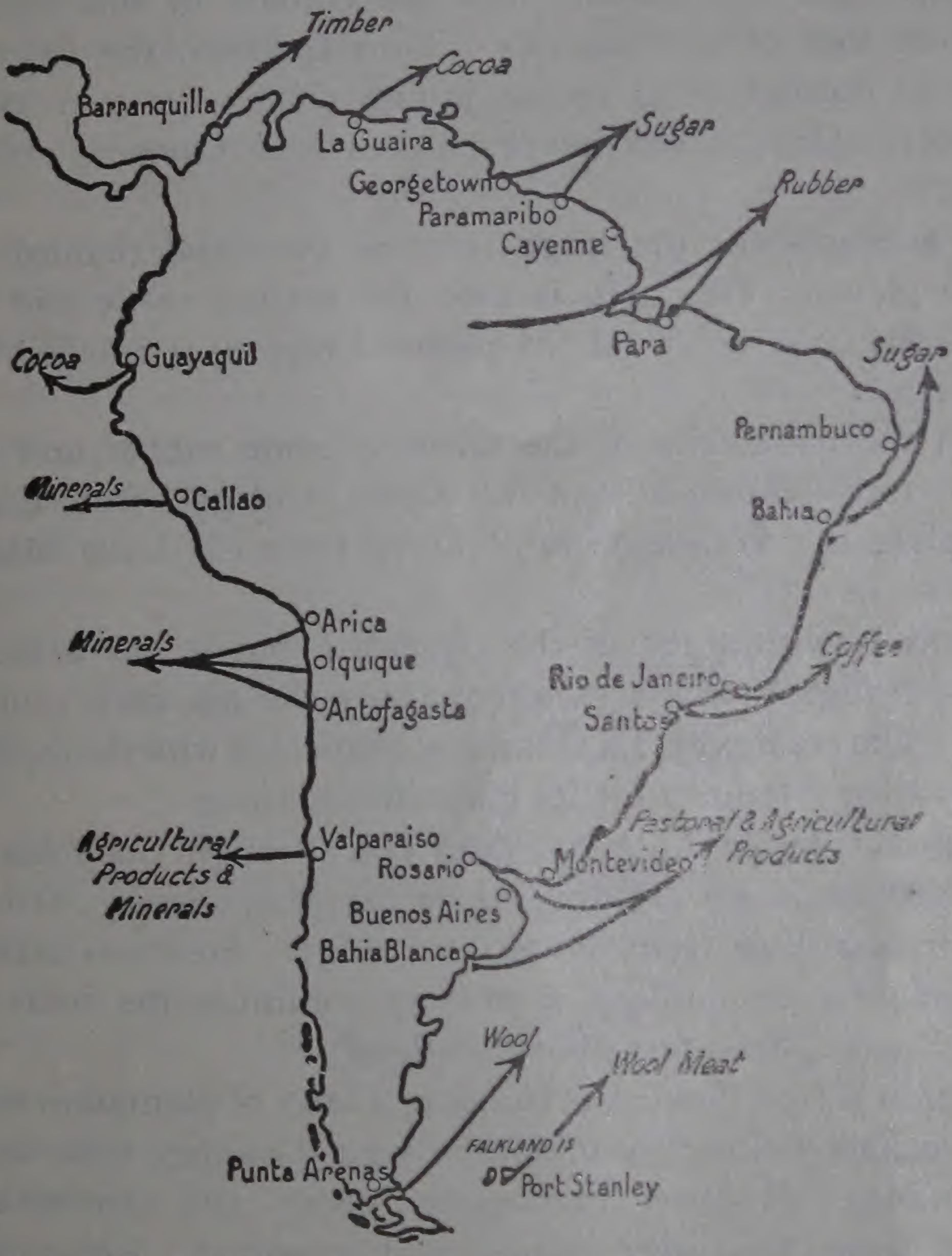


FIG. 85.—THE "OUTLETS" OF SOUTH AMERICA, AND THEIR SPECIAL COMMODITIES.

brown sugar exported is called "Demerara," after the river valley from which it comes. On the plain there are also plantations of coconuts, coffee and rice. Sugar-growing is the chief occupation in Dutch territory, and gold-working in French Guiana. Georgetown on the Demerara river is the port of British Guiana;

Paramaribo and Cayenne are the ports of Dutch and French Guiana respectively.

Venezuela is practically the basin of the Orinoco, but some of the tributaries of that river rise in Colombia. Venezuela is in many respects like Guiana, for it has a coastal plain with large plantations of coffee, sugar and cocoa. But the climate of this republic is drier than that of the Guianas. Thus Caracas, the capital, has an annual rainfall of 32 inches falling chiefly between May and November. Georgetown has 87 inches, and Cayenne 118 inches per year.

This accounts for the large tract of grassland (llanos) on the Orinoco plains. This area is used for rearing cattle and horses. Bolivar, the chief centre of the pastoral region, is reached by sea-going vessels.

Down the tributaries of the Orinoco come rubber and timber, from the forested foot-hills of the Andes, and gold from the mines in the plateau. Petroleum is obtained from the Lake Maracaibo region.

Caracas is within 10° of the equator; but it has a delightful climate because it stands 3000 feet above the sea, on a spur of the Andes. The chief port, La Guaira, is connected with the capital by a 20-mile railway famous for its magnificent views.

Colombia. Three Andean ridges run through Colombia. The valleys between them are drained by the Magdalena. Tributaries of the Orinoco flow from the eastern ridge. Steamers ascend the Magdalena for 600 miles; a railway continues the route to the capital, Bogota, 8700 feet above sea-level.

Colombia is like Venezuela in being a land of plantation workers. Its plantations yield coffee of specially good quality, tobacco, cocoa and bananas. Rubber, mahogany, cedar and dye-woods are obtained from the selva region and exported. Colombia had formerly a flourishing trade in cinchona. This has declined through the establishment of cinchona plantations in India and the East Indies.

The country has great mineral wealth. Emeralds have been mined for 400 years. Gold is worked near Medellin on the Andean plateau. In addition there are stores of platinum, copper, coal, salt and oil.

Few industries are carried on in Colombia. One of the most important is the making of Panama hats at Bogota. They are made from the fibres of the leaves of a pine, and they find a good market in the West Indies and other lands. The chief ports are Cartagena, Sabanilla, and Barranquilla.

The Andean states, Ecuador, Peru and Bolivia are in the torrid zone. But each has a large area of high plateau, where the climate is anything but tropical. Quito, for example, has a hottest month temperature of 55°, and a coldest month mean of 54°. There is little variation in temperature from season to season on the plateau. There is actually a much greater difference between day and night temperatures.

Ecuador (equator-land) rises from the hot Pacific coastal plain to the snow-clad volcanic peaks, Cotopaxi and Chimborazo, and then falls away to the Amazon basin. The low land in the east is clothed with tropical forest, which yields rubber and material for Panama hats. But Ecuador is best known to the commercial world as a producer of cocoa. Valuable cacao plantations are on the coastal plain round the Gulf of Guayaquil, and on the hillsides facing the sea. Cocoa forms four-fifths of the exports of the country. Ecuador is believed to possess valuable minerals, but they are not worked.

The port of Guayaquil was until recently a hot-bed of yellow fever. The disease has been practically stamped out by an American organisation. A railway 218 miles long connects the port with the capital Quito, 9300 feet above the sea. Near the city is the active volcano Cotopaxi, noted for its pumice-stone, and for the clouds of vapour it emits. Quito has suffered greatly from volcanic eruptions and earthquakes.

Peru consists of a narrow coastal plain, a high plateau between Andean ridges, and a low-lying area east of the mountains traversed by the upper Amazon and its tributaries. These rivers have cut deep valleys in the Andean slopes.

Peru has therefore great variety in climate and in productions. The coastal plain is desert in some places, but irrigated portions are used for growing sugar, cotton, tobacco, cocoa and rice. Long staple cotton grown in the Piura valley is exported for the manufacture of webbing for motor tyres. On the uplands, Peruvian

products are like those of the Mediterranean—grapes, olives and other fruits, and grains. Higher still there are extensive pasture lands. These are used for rearing wool-producing animals, especially the alpaca and llama. These animals correspond to the yak of Tibet; they are used as beasts of burden in the mountains. The Amazonian portion of Peru is very fertile but thickly wooded; it is therefore thinly peopled. Iquitos, the chief town, is a rubber-collecting centre.

Minerals are abundant. Peru supplies 95 per cent. of the world's vanadium. Copper, silver, gold and petroleum are also worked. The Peruvians are giving great attention to industries, and improving means of communication. The chief industries are connected with the raw materials the country produces—copper-smelting, and the manufacture of textiles, leather and chocolate. The capital, Lima, is on the coastal plain, 8 miles from Callao, the principal port.

Bolivia is a coastless country, but the capital, La Paz, is connected by railway with the Chilean ports Arica and Antofagasta.

The country consists of a high plateau, and a lowland region east of the Andes. The plateau lies between Andean ridges, overlooked by Sorata, Illimani and other high peaks. The climate of the plateau is dry. Rivers flow from glaciers to Titicaca and other lakes, and they provide water for irrigation.

The people do the same kind of work as the Peruvians—plantation work and agriculture in the low land, pastoral work, agriculture and mining on the plateau. But mining is more important in Bolivia. Many of the towns, Potosi, Sucre, Oruro, have developed from mining settlements. Tin forms the bulk of the exports, Bolivia being the second largest producer in the world. Other minerals worked are gold, silver, lead, antimony and bismuth.

Paraguay, another inland country, consists of two valleys (Parana and Paraguay) separated by a spur from the Matto Grosso highlands. The country is almost bisected by the tropic of Capricorn. The high land is used for cattle-ranching. In the valleys the people are engaged in agriculture and plantation work. A special product is Paraguay tea (maté), grown in the district round Asuncion, the capital.

II. TEMPERATE COUNTRIES

Argentina includes the greater portion of temperate South America. The country extends from a little north of the tropic of Capricorn to Cape Horn, and from the Andes to the Atlantic coast. Apart from the belt of Andean uplands, Argentina is a vast plain.

The plain may be divided into two parts. The northern part is sub-tropical in character, the southern part is temperate. The northern portion is partly wooded (the Gran Chaco), and partly plantation land. Tucuman, the chief town, is near the foot of the Andes. It is surrounded by plantations of sugar-cane, cotton and tobacco.

The southern part of the plain was formerly a treeless expanse of grassland, called pampas. Its bareness has been reduced by introducing the eucalyptus tree from Australia ; and much land has been broken up for agriculture. The inhabitants of this region are engaged mainly in pastoral work and agriculture. Large numbers of sheep, cattle, horses, pigs and goats are reared on ranches in the Cordoba district, and there are large sheep farms on the poorer pastures of Patagonia. From these come meat, hides and wool to be exported through Buenos Aires and Bahia Blanca. Argentine frozen meat finds a good market in Britain and other European countries.

An agricultural region lies on each side of the Parana, near Rosario. The level land is worked with up-to-date machinery. The district produces wheat, maize, oats and linseed, and there is a large surplus for export. Rosario, the great collecting centre, can be reached by large vessels.

Another agricultural region lies amongst the foot-hills of the Andes, near Mendoza and San Juan. This is a dry region. San Juan has an annual rainfall of 2·5 inches only ; but droughts sometimes last for two or three years. Mountain streams provide water for irrigation ; brilliant sunshine helps to ripen fruit. Grapes and other sub-tropical fruits are grown, and a wine industry is carried on.

Buenos Aires is a fine city, with a population of 16 lakhs—one-fifth of the population of the whole country. Large docks and warehouses have been constructed along the banks of the River

Plate. The city is connected with Valparaiso, on the Pacific coast, by the trans-Andine railway. This is carried over the mountains by Uspallata Pass.

Uruguay is an eastern extension of the pampas. The country might almost be described as a great ranch, for the grazing region is more than twenty times as large as the agricultural land. Ninety-five per cent. of the exports consists of animal products. On the river Uruguay are the towns Fray Bentos and Paysandu, two of the best known meat-packing centres in the world. Monte Video, capital and seaport, is on the northern shore of the Plate estuary. In the city there are large factories where meat, skins and wool are prepared for export.

FIG. 86.—THE RIVER PLATE REGION AND THE TRANS-CONTINENTAL RAILWAY.

Chile is a long narrow country between the Andes and the South Pacific. The land is frequently shaken by earthquake. On a small-scale map Chile appears to be simply the west slopes of the Andes. But there is a smaller range between the Andes and the coast. A large portion of the population is found in the long valley between the ranges ; here also is the capital, Santiago.

The northern part of Chile is desert (Atacama). The southern part, in the west wind belt, is wet and inhospitable. The central portion has an excellent climate, with moderate rainfall—chiefly in winter. With the aid of irrigation this region yields excellent crops of wheat and barley, grapes and other fruit. Some of these are exported to other South American states.

On the borders of the desert there are extensive grazing lands, where cattle and merino sheep are reared. But the numbers are small compared with those of Argentina. So far as foreign commerce is concerned, the chief wealth of Chile is found in the desert. Here there are thick beds of nitrates below the desert sands. The

nitrates are valuable fertilisers, preserved in Chile by absence of rain, and of vegetation which would have drawn upon them. Some 14,000 men are employed in the nitrate fields. The material is dug up and sent down a narrow-gauge railway to Iquique, Antofagasta and smaller ports.

Copper is mined for export, chiefly to Britain, and coal of indifferent quality is worked in the south for export to neighbouring

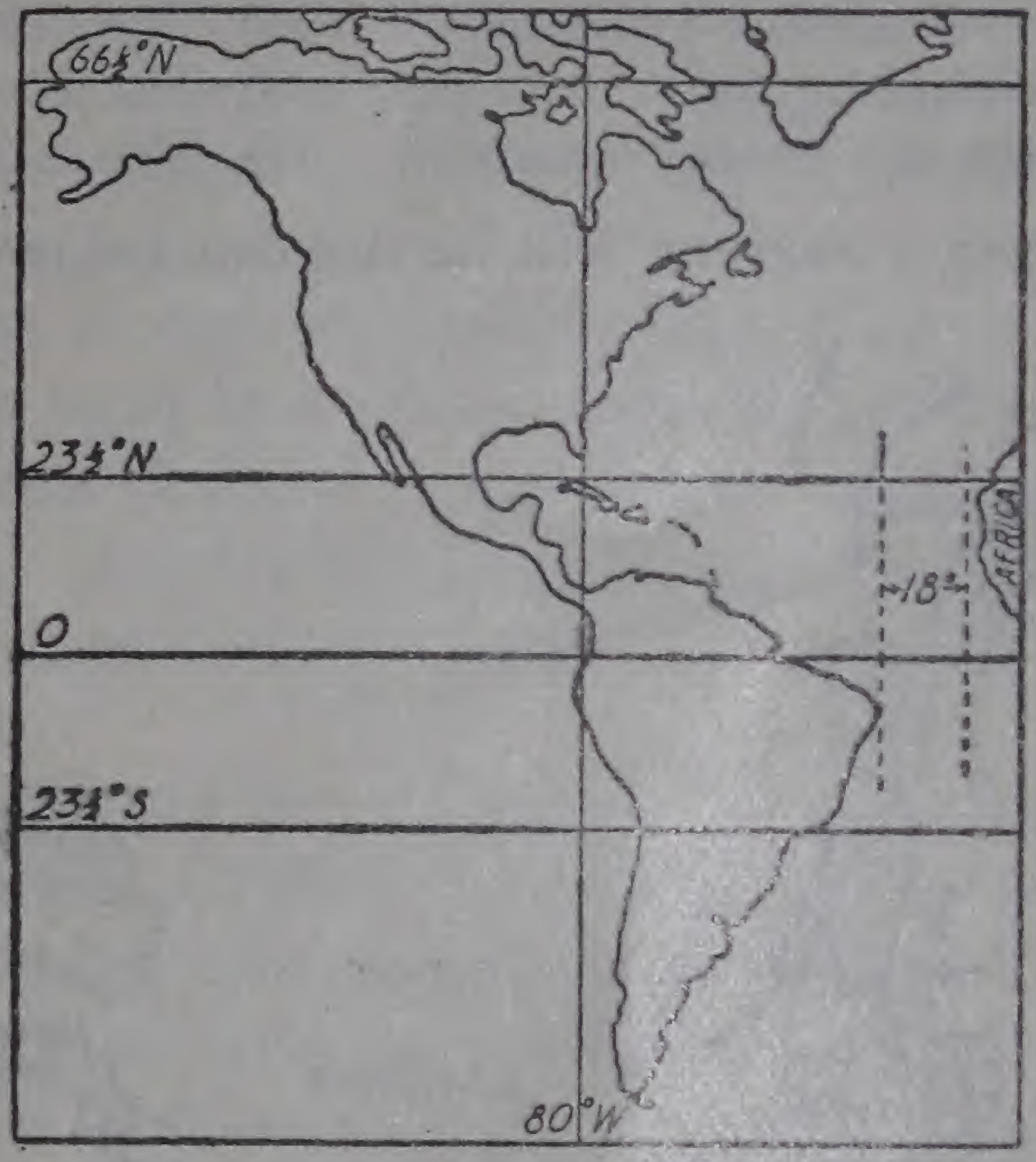


FIG. 87.—THE SITUATION OF THE AMERICAN CONTINENTS.

states. Chile imports coal from Australia. Valparaiso (Valley of Paradise), the chief port on the Pacific coast of South America, controls practically the whole of the import trade of Chile. Punta Arenas, a small port in the extreme south, is the outlet for wool and mutton from the sheep farms behind it.

EXERCISES

1. Describe the situation of the mountain regions and plains of South America. Show the position of the mountains in a sketch map; say what effect the mountains have upon climate.

2. Mark in a sketch map the position of the forests, grasslands and deserts of South America. Write a short account of the work done by the inhabitants of each region.

3. Write out lists of agricultural and plantation products of Brazil. Say which of them are grown in India.

XXI. NORTH AMERICA—PART I

I. SURFACE RELIEF AND RIVERS

North America consists of three highland regions and three lowland regions. They are:

Highland Regions.	Lowland Regions.
(*a*) The Western Mountain Systems.	(*a*) The Central Lowlands.
(*b*) The Eastern Highlands.	(*b*) The High Plains.
(*c*) The Highlands of Central America.	(*c*) The Atlantic Plain.

One or two minor regions will be noticed below.

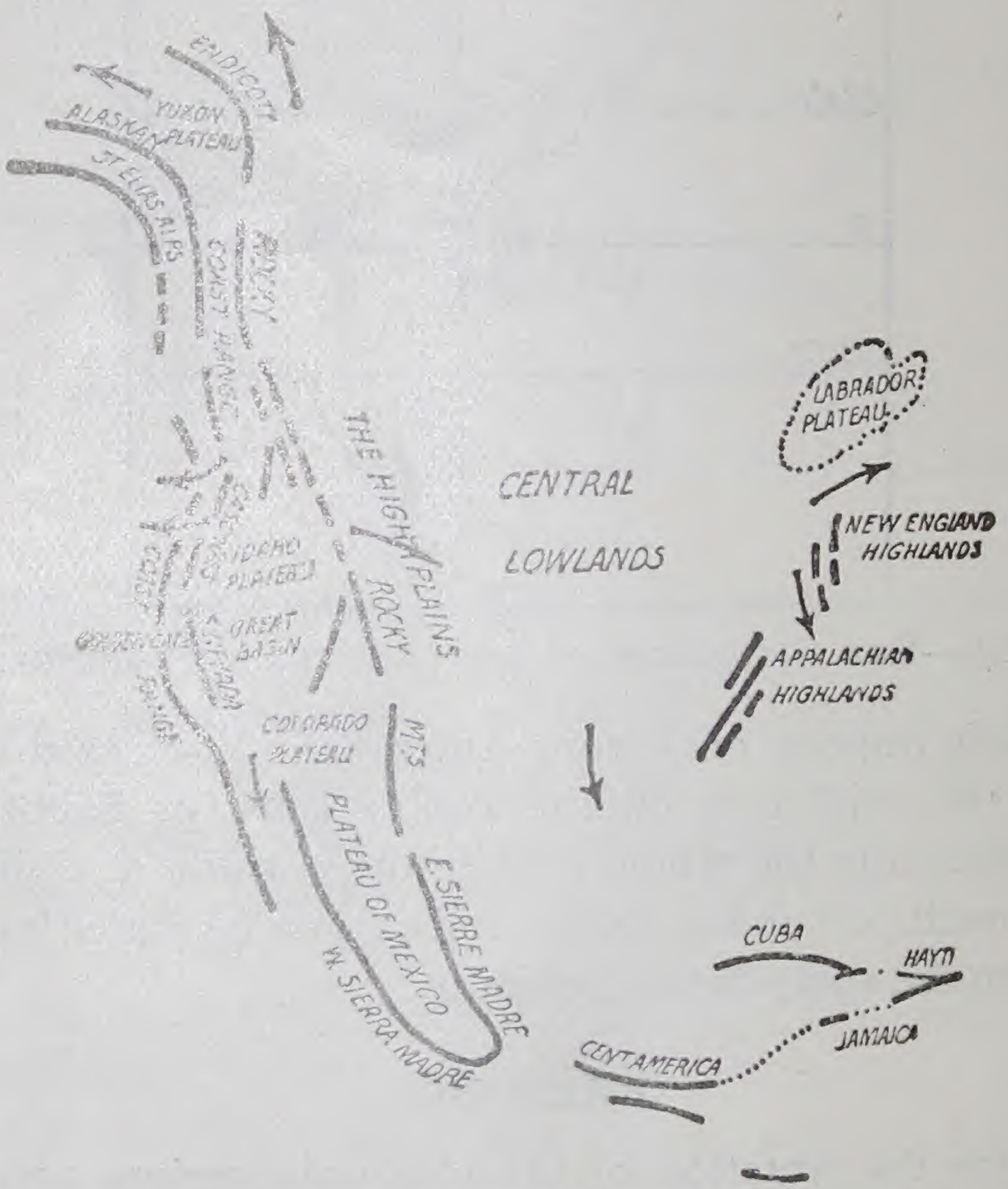


FIG. 88.—PLAN OF THE HIGHLANDS OF NORTH AMERICA.
(Name the rivers indicated by the arrows.)

The Western Mountain System stretches from Alaska to the isthmus of Tehuantepec. It is properly described as *huge*. In the United States it is 1000 miles wide. A large number of its peaks reach an altitude of about 3 miles

The mountain ridges can be traced along three separate lines. **The most easterly ridge** is called the Endicott Range in Alaska, and Rocky Mountains in Canada and the States. Robson and Alberta in Canada, Long's Peak and Pike's Peak in the States, have their summits more than $2\frac{1}{2}$ miles above sea-level.

The **second great ridge** comes through the Alaskan Range, the Coast Range of Canada, the Cascades and Sierra Nevada of the United States. In the Alaskan Range is Mount McKinley (20,300), the highest peak in North America. The Sierra Nevada contains a number of lofty mountains—Shasta, Lyell, Whitney; some are extinct volcanoes.

The **third ridge** is seen in the St. Elias Alps of the far north. St. Elias itself is more than three miles high. The ridge is seen again in the Coast Range of the States, and the backbone of Lower California. In between it has been partly submerged. This accounts for the large number of islands and fiords on the coast of British Columbia.

Between the first and second ridges lie a number of **plateaux**. Far away in the north is **Yukon** plateau, drained by the river Yukon, which flows to Bering Strait. Next comes **British Columbia**. It is a plateau with most irregular surface. The Selkirks and Gold Range run almost north and south. Between them and the main ridges are deep valleys, with rivers and chains of lakes. The country is difficult to traverse, but the scenery is magnificent. Farther south, there are three plateaux in the States and another in Mexico. Each has a distinctive feature.

The **Snake River plateau** (in Idaho), like the Deccan, is built of lava (see page 57). South of this lies the **Great Basin**, between the Wahsatch mountains and Sierra Nevada. "Basin" describes its surface. Under the shadow of the Wahsatch mountains lies the Great Salt Lake, its shores white with crystals of salt. The general level of the Great Basin is about 5000 feet, but in the south-western corner, near the Sierra Nevada, is the **Death Valley**, which is actually 300 feet below the level of the sea. South of this again comes the **Colorado plateau**, in which the river Colorado has carved its famous canyon (see page 61). Next is the Mexican plateau, built of lava. Near the southern end are some extinct volcanoes. The largest is Orizaba (18,000 ft.). The edges of the plateau, called

Sierra Madre, slope steeply down to a narrow coastal plain on each side. This widens out in Yucatan, which is one of the few peninsulas in the world that point northwards.

Between the second and third ridges there are some remarkable depressions. The most southerly one, flooded by the sea, is the **Gulf of California.** North of this is the beautiful **Valley of California.** It is drained by the San Joaquin and Sacramento. These reach the sea through a break in the Coast Range called the **Golden Gate.** Northwards the line of depressions can be traced through Puget Sound, the Strait of Georgia, and Queen Charlotte's Sound, which separate Vancouver Island from the mainland.

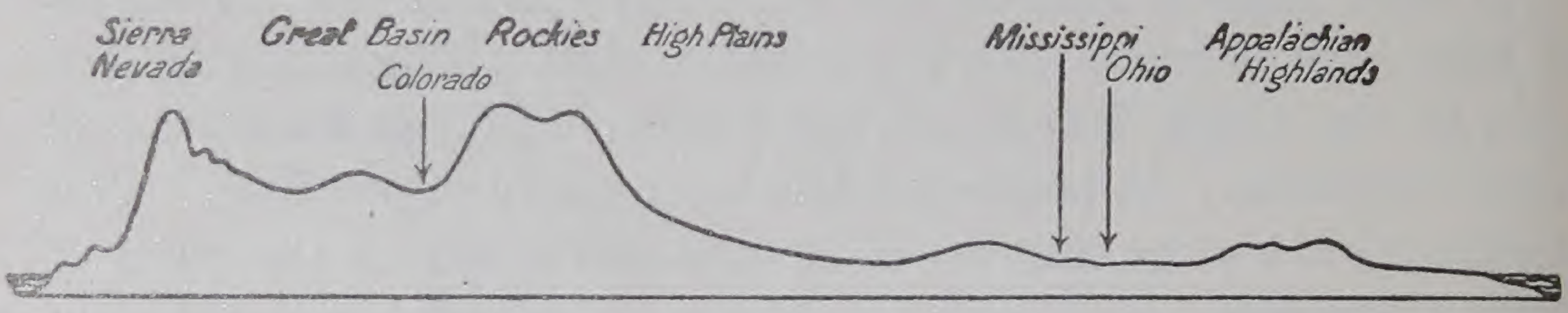


FIG. 89.—DIAGRAMMATIC SECTION ACROSS NORTH AMERICA BETWEEN 35° AND 40° N.

The Eastern Highlands. The Eastern Highlands extend from the coast of Labrador to within 150 miles of the Gulf of Mexico. The St. Lawrence and the Hudson divide them into three portions—the **Labrador Plateau,** the **New England Highlands** and the **Appalachian Highlands.**

The Labrador Plateau is composed of hard old rock. The soil generally is thin. The southern portion of the plateau bears much coniferous forest. The country is studded with lakes. Innumerable rivers descend swiftly to the St. Lawrence estuary; they provide valuable sources of power.

The New England Highlands form a beautiful region of forested hills and valleys, lakes, rivers and waterfalls. In this region there are many holiday resorts for people of the towns in the plain. Between the Catskills and the Adirondacks on the west and the Green Mountains on the east there is an important route to Canada. It leads from New York to Montreal, and is called the **Hudson-Champlain route.** Another route branches off westwards. This, the **Hudson-Mohawk route** (Fig. 96), leads from New York to Buffalo, Chicago and the western states. Northwards, the New England

Highlands are prolonged over the border into Canada. They form the Gaspé peninsula, beside the St. Lawrence.

The Appalachian Highlands consist of a number of parallel ridges, valleys, and low plateaux. One of the ridges is called the Alleghany Mountains. At the foot of these mountains, on the eastern side, there is the Piedmont Plateau (*i.e.* mountain foot plateau). A large number of rivers descend from the Piedmont plateau to the Atlantic plain by waterfalls. Thus is formed a well-known feature called the **Fall Line.** The falls are a check to navigation, but they are a source of power.

The Central American Highlands consist of a plateau and a line of volcanic mountains. The plateau is built partly of lava. It lies in four states—Guatemala, Honduras, San Salvador, and Nicaragua. The line of volcanic mountains runs through Costa Rica and Panama. The two highland areas are separated by a deep depression, in which lies Lake Nicaragua, only 100 feet above the sea. Central America must once have extended much farther east. Subsidences produced the Gulf of Mexico and the Caribbean Sea. Many of the West Indian islands are unsubmerged parts of that old land area. The Bahamas, however, are of coral formation. Earthquakes and volcanic eruptions in Central America and the West Indies show that the region is not yet properly "set."

The Central Lowlands extend from the Arctic shores to the Gulf of Mexico. Almost midway there is a low watershed. It is just high enough to separate the Red River and the Mississippi. Thus the Canadian portion of the lowlands slopes gently to the north and east. Its greatest river, the Mackenzie, has three large lakes—Athabasca, the Great Slave and the Great Bear—in its course. But its value for transport is small. It flows into an ocean that is usually blocked with ice. The Nelson, which flows from Lake Winnipeg to Hudson Bay, loses value for a similar reason.

The southern portion of the lowlands slopes to the south. It has one large river, the Mississippi. This receives the Missouri, Arkansas and other streams from the Rockies, the Ohio, Tennessee and others from the Appalachian highlands.

The Mississippi meanders slowly through its alluvial plain. In the lower reaches the river is above the level of the land on each side This is due to the deposition of sediment upon its bed. The banks

are strengthened to protect the land from floods. Much sediment is carried to the sea. It forms sandbanks about the mouths of the river, and helps to enlarge the delta. Dredging is necessary to maintain a good waterway to New Orleans. The slow wide river and its tributaries are greatly used for transport of merchandise and passengers.

The soil of the central lowlands is fertile almost everywhere, but all parts are not equally productive. Climate causes differences. The northern plain stretches beyond the Arctic Circle; the southern part is near the tropic of Cancer. The consequences of this we shall notice later.

The High Plains lie to the west of the central lowlands. They stretch along the foot of the Rocky Mountains, from the Mackenzie to the Rio Grande. The land has an altitude of from three to six thousand feet. This region should really be called a plateau. But the ascent from the lowlands is gradual, and the Rockies rise like a gigantic wall above the High Plains. The region is altogether different from the lowlands. One part of it, in Nebraska, is called the "Bad Lands." Much of its soil has been removed to the lowlands by rivers, and the land is bare and barren. In many places, however, the High Plains form good grazing land.

The Atlantic Plain stretches from Nova Scotia to Florida, widening out towards the south. It rises gently from the coast to the edge of the Piedmont Plateau. The "Fall Line" marks the boundary between the two areas. The plain is composed of sediment. It is very fertile, and supports a large population. The northern part of the coast is very irregular. Fundy Bay, Boston Harbour, New York Harbour, Delaware Bay, Chesapeake Bay and many smaller inlets are "drowned valleys." They are sea entrances to the country. On each there are large ports. Farther south the shore is fringed with low sandy islands and lagoons. Along the coast of Florida there are coral islands.

II. CLIMATE AND VEGETATION

Many different types of climate may be distinguished in North America. First there is a region of **tundra** type. This is a belt of land, about 300 miles wide, fringing the Arctic Ocean. It stretches from Alaska to Labrador. The region has short warm summers,

but long and very cold winters. Dawson (near the Alaska boundary) has a mean monthly temperature of $-24°$ in January, and 60° in July. During the greater part of the year the ground is covered with ice and snow. Vegetation consists of grass, mosses, lichens, and some stunted shrubs and trees. (Refer to Figs. 91, 93.)

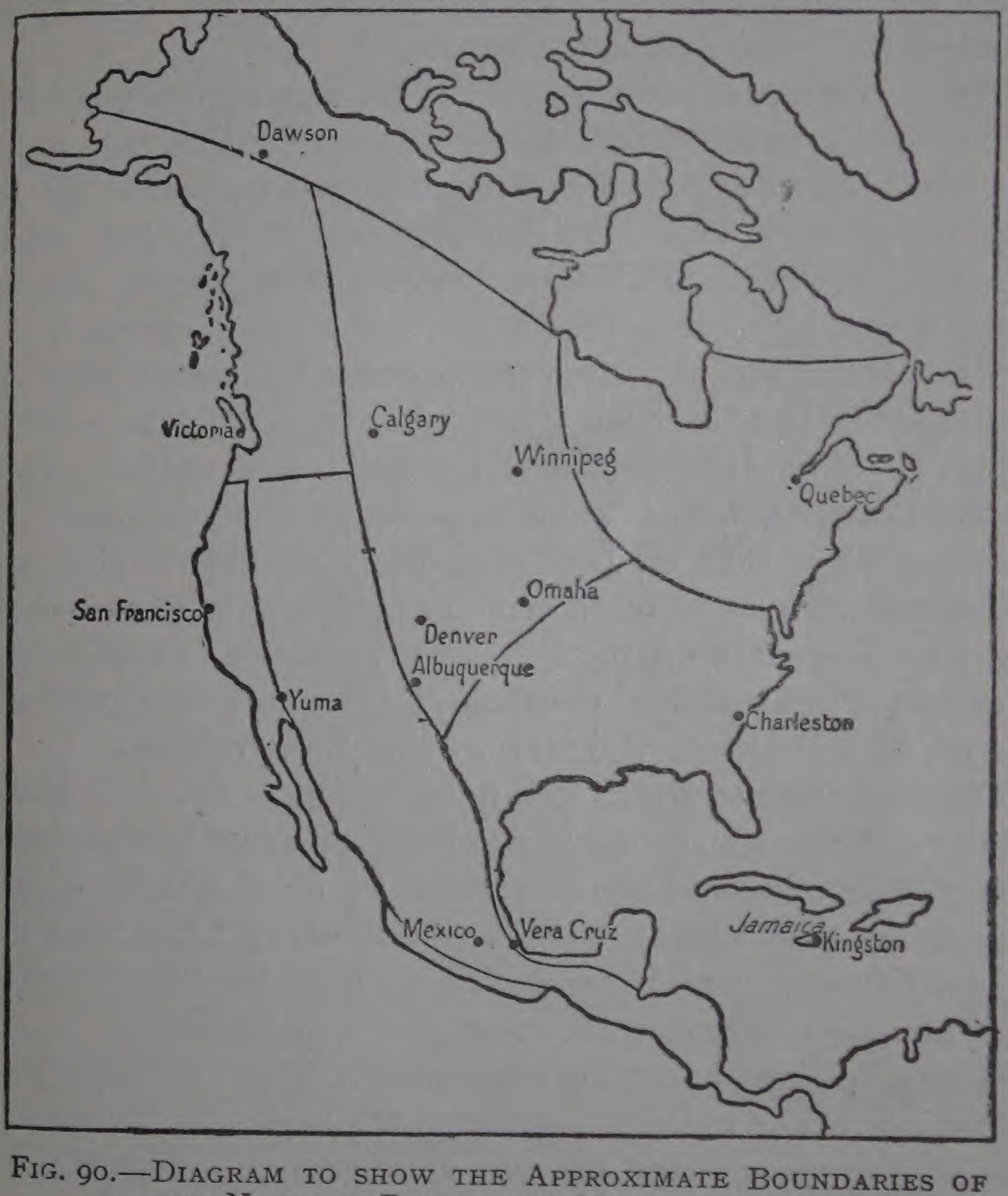


FIG. 90.—DIAGRAM TO SHOW THE APPROXIMATE BOUNDARIES OF THE NATURAL REGIONS OF NORTH AMERICA.

Now follow the western margin of the continent southwards. The boundary of the first portion may be taken near the Columbia river. This is the region of the westerly winds. Its climate is greatly influenced by these winds, and by the ocean current which the winds drive towards its shores. Summers are warm, winters are cool. Victoria has a mean temperature of 40° in the coldest

month (January), and 61° in July. Rain is brought at all seasons by the westerly winds; but most of the rain falls on the seaward slopes of the mountains. There are dry belts amongst the ranges of British Columbia. The climatic conditions generally are very favourable to tree growth. The region has some magnificent forests which contain both deciduous and coniferous trees. For further details of these forests, refer to Chapter XII.

The next western margin region is the shoreland of California. It is of **Mediterranean type**. Summers are warm and dry, winters are mild. There is moderate rainfall in winter, due to the fact that the westerly winds extend southward during that season. San Francisco has a mean annual rainfall of 23 inches; but only 1 inch of rain falls during the five months, May to September.

South of this Mediterranean region comes a region of **desert and semi-desert**. This includes the Colorado basin, the plateaux behind the Sierra Nevada, and part of the Mexican plateau. Yuma, on the Colorado, has an annual rainfall of 3 inches only. The semi-desert has some curious examples of giant cactus (Fig. 94).

The **eastern margin** of the continent may be divided into two regions. These are (*a*) the St. Lawrence region, which includes parts of both Canada and the United States near the Great Lakes and the St. Lawrence; and (*b*) the South-Eastern States.

The **St. Lawrence region** has warm summers and cold winters. The Great Lakes and the estuary are frozen over for several months. The climate of this region is affected by the Labrador Current. This brings large masses of ice, which do not melt until they meet the Gulf Stream near Newfoundland. Then the ice-cold current creeps farther south, near the coast.

Quebec has mean monthly temperatures of 10° in January and 66° in July. The winter is less severe at places near the open sea. The St. Lawrence region has rain at all seasons. This is largely due to cyclones, which cross the region at frequent intervals.

The **South-Eastern States** have mild winters and hot summers. The monthly temperature of Charleston ranges from 49° to 81°. Rain falls at all seasons, but especially in summer. Cyclones frequently traverse the region. Hurricanes which originate in the West Indies often move to the Gulf of Mexico. Then they turn and follow a destructive course to the north-east.

Abundant rainfall along the whole of the eastern margin encourages the growth of plants. Much land has been cleared for agriculture; but portions of the forests which once spread over the regions still remain. The type of forest varies with climate—

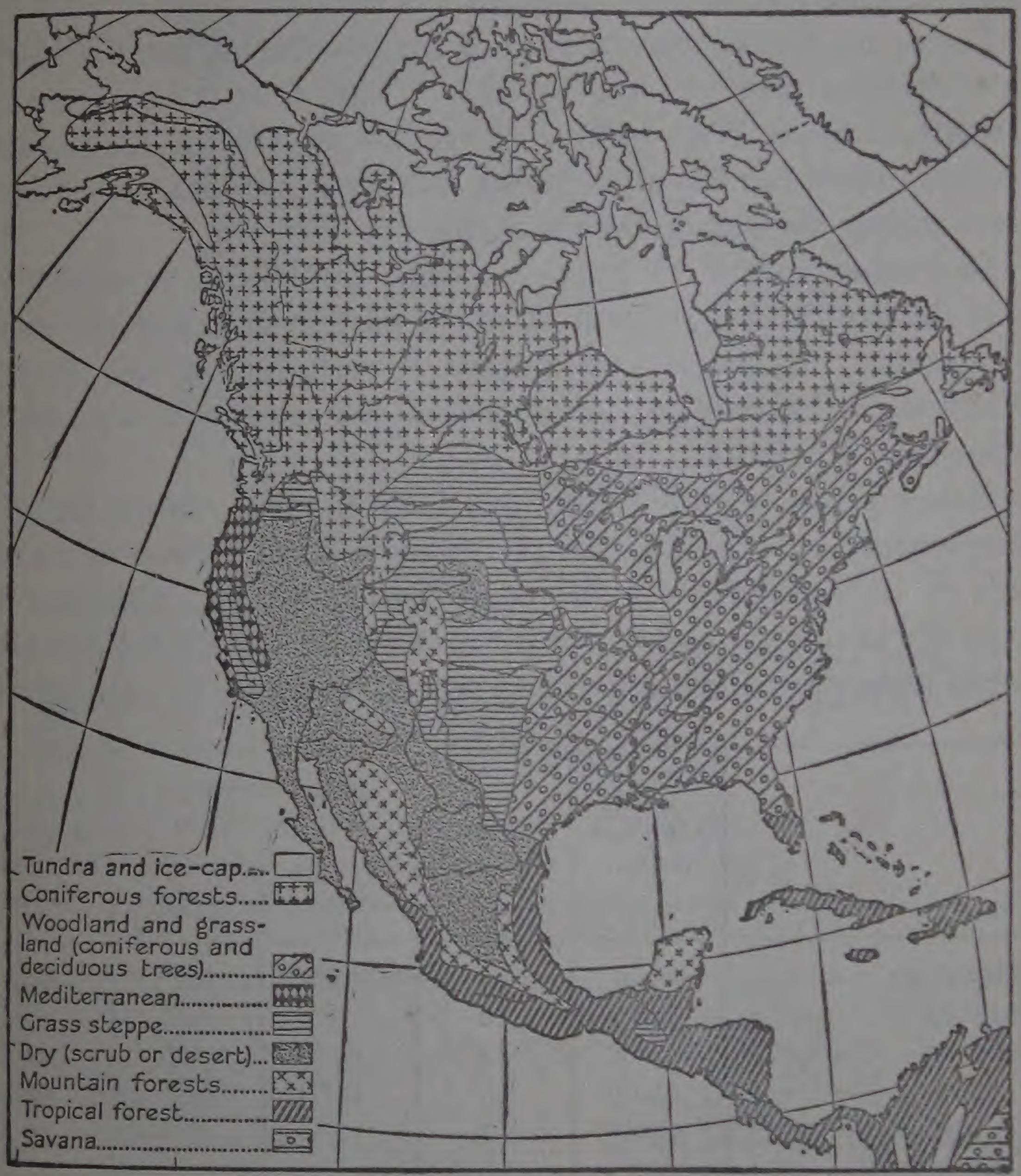


FIG. 91.—NATURAL VEGETATION OF NORTH AMERICA

coniferous and deciduous in the St. Lawrence region, evergreen in the South-Eastern States. In the south of Florida the forest is tropical in character.

Central America, the low shorelands of Mexico, West Indies form a separate region. These lands lie in one, and in the track of the north-east trades.

moist, and the vegetation is very luxuriant. The interior of Mexico has a climate modified by altitude; it is also a region of low rainfall. The highest mean monthly temperature at Mexico City is 65°; at Vera Cruz it is 82°. Mexico City has 23 inches rainfall, whilst Vera Cruz has 68 inches per year.

Places on the windward side of the mountains receive heavier rainfall than those on the lee side. This is so in both Central America and the West Indies. Kingston in Jamaica, for example, has an annual rainfall of 36 inches, but Port Antonio, on the windward side of the island, has 139 inches per year.

One other portion of North America has still to be considered. It is the **Central Belt**, consisting of the eastern flanks of the Rocky Mountains. Its eastern boundary is, roughly, a line through Winnipeg. This region is remote from the sea, and it is on the lee side of the Rockies.

Hence places within its borders have a great annual range of temperature, and most of them have low rainfall. Most of the rain falls in early summer. It is caused by convection. Currents rise from the heated ground whilst the air above is still cold. The table below gives particulars relating to several towns in the central belt.

	Altitude (feet).	Rainfall (inches).	Mean Monthly Temperature.		Annual range of Temperature.
			Jan.	July.	
Winnipeg - -	1492	21	−3°	66°	69
Calgary - -	3389	16	13°	61°	48
Denver - -	5272	14	29°	71°	42
Omaha - -	1103	30	20°	76°	56
Albuquerque -	5200	7	34°	77°	43

The rain has little effect upon the soil below the surface. Hence there is no luxuriant vegetation. But there are hundreds of miles of undulating grassland, called "prairie," broken along river courses by clumps of trees. In former times the prairie was the home of great herds of bison, which were hunted by Red Indians. Bison no longer roam the plains; they are now to be seen only in the great National Parks where they are preserved from extinction.

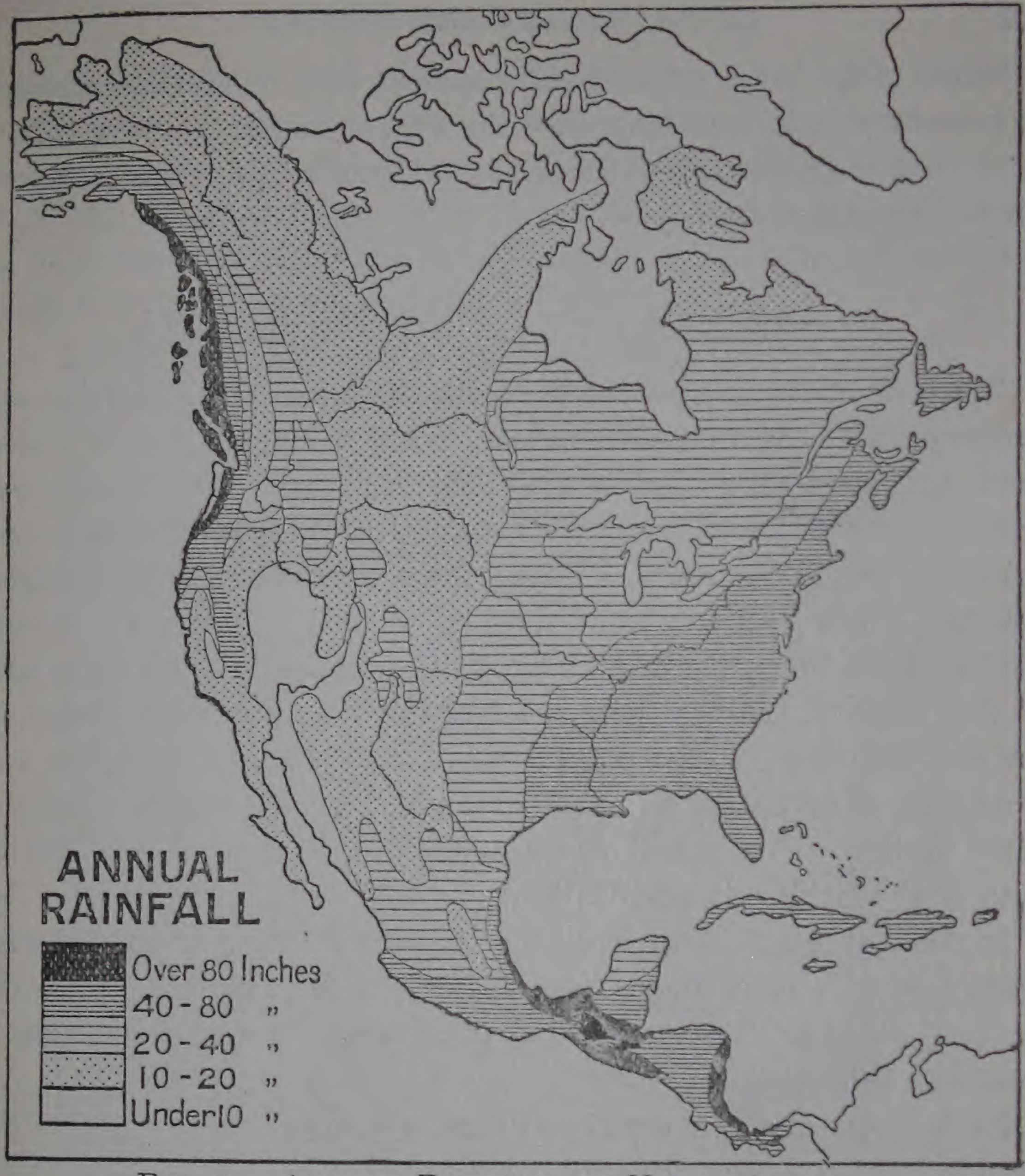


FIG 92 —ANNUAL RAINFALL OF NORTH AMERICA

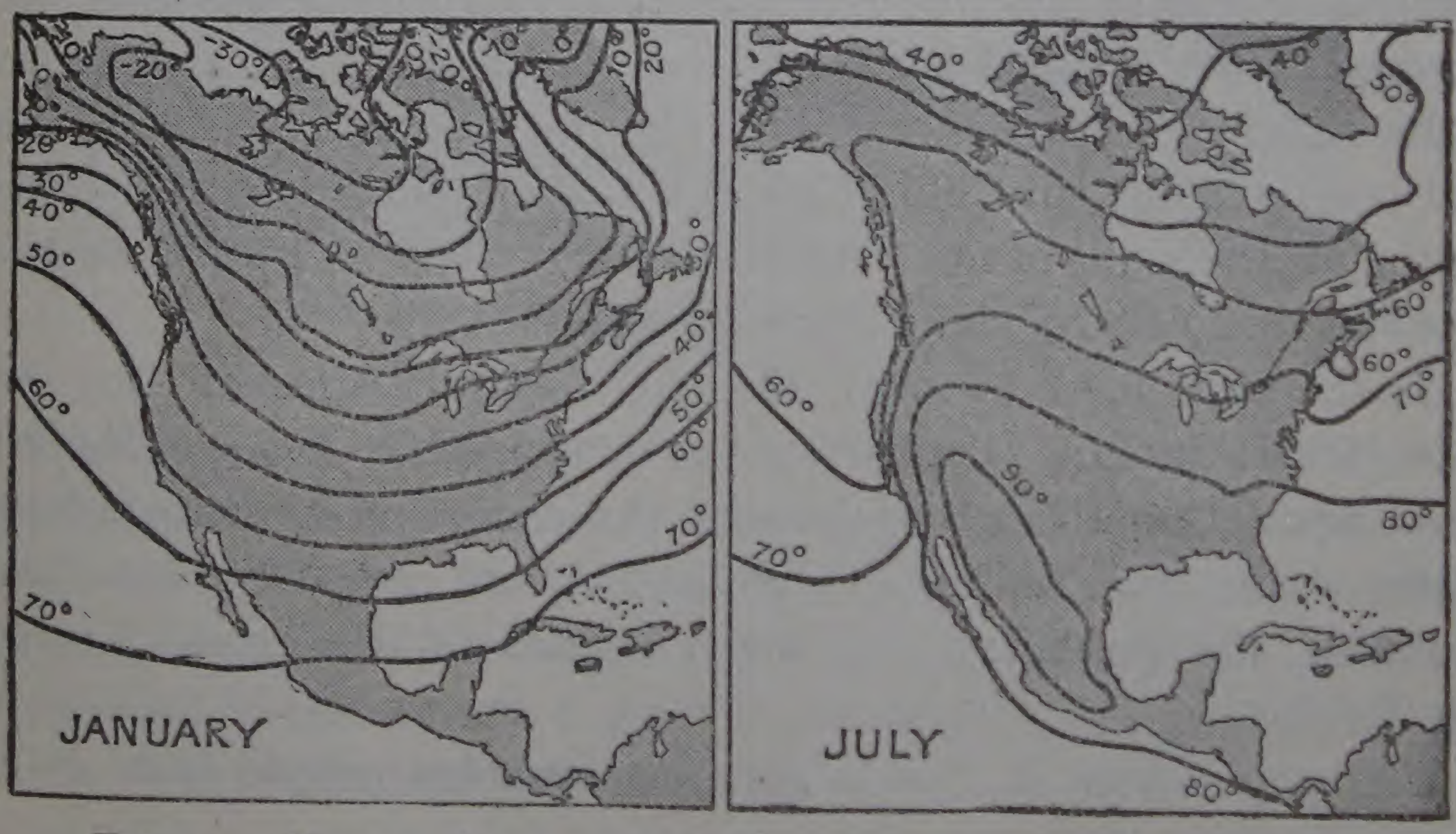


FIG 93.—NORTH AMERICA: JANUARY AND JULY ISOTHERMS

Much of the lower prairie land has been broken up and irrigated. It forms an important corn-growing area. Large tracts of higher land—the High Plains—are still natural grasslands. They are used for ranching purposes.

III. THE PEOPLE OF NORTH AMERICA

When Europeans discovered North America, the continent was thinly peopled by nomadic tribes. They belonged to the yellow race, and were long known as "Red Indians." During the sixteenth and seventeenth centuries many European settlements were made in North America. These were named after the mother-country. **New France** was established on the St. Lawrence estuary. **New England** consisted of a number of colonies in the northern part of the Atlantic plain. Separate English colonies were formed in the southern part of that plain; these were Virginia, Carolina and Georgia. **New Spain** included Mexico, Central America and the West Indies. The Spaniards also took possession of the belt of land between Florida and California.

In the eighteenth century all the English colonies on the Atlantic plain joined to form the **United States.** They separated from the mother-country. They extended their territory westwards until it reached the Pacific coast.

During the same century New France (Quebec) became part of the British Empire. Many people in that province still speak French. Before the end of the eighteenth century English colonies had been formed in the forested lands of Nova Scotia, Ontario, and on the banks of the St. Lawrence. The discovery of gold in the far west led people to British Columbia. Last of all, people began to settle in the prairie lands of the "middle west." Here Manitoba, Saskatchewan and Alberta came into existence.

Spain continued to own Mexico, Central America and certain West Indian islands for a considerable time. Mexico, the Central American States—with the exception of British Honduras—and the islands, Cuba and Haiti, are now republics. Jamaica, the Bahamas, and many islands in the Lesser Antilles are British.

The population of North America includes people from every

country in Europe and Asia. The English language is spoken north of the Rio Grande, Spanish to the south of that river.

Natives (Red Indians) are most numerous in Mexico and Central America. But there are many in the United States and Canada. In these two countries some live amongst the white people, others in lands set apart for them and called " reservations."

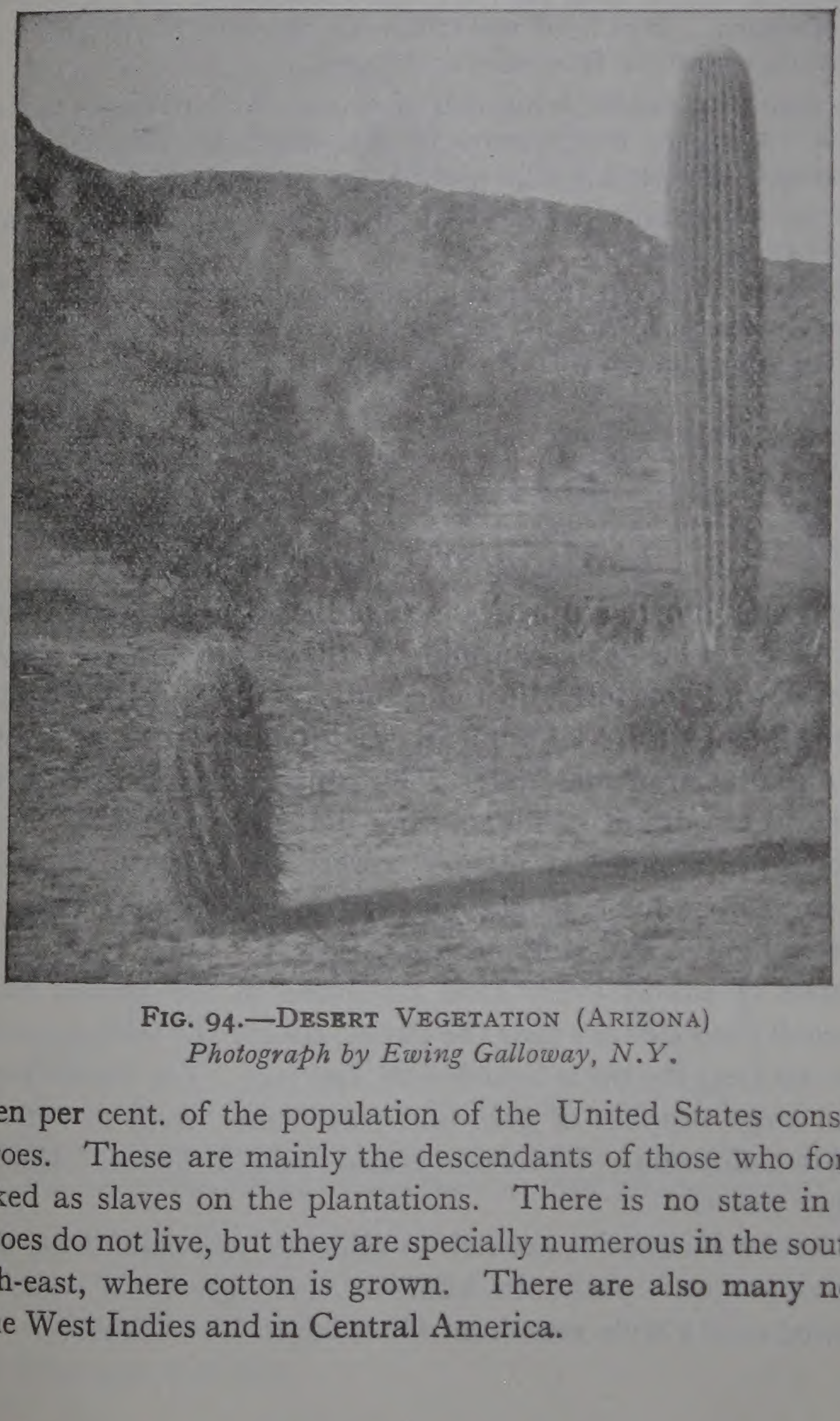


FIG. 94.—DESERT VEGETATION (ARIZONA)
Photograph by Ewing Galloway, N.Y.

Ten per cent. of the population of the United States consists of negroes. These are mainly the descendants of those who formerly worked as slaves on the plantations. There is no state in which negroes do not live, but they are specially numerous in the south and south-east, where cotton is grown. There are also many negroes in the West Indies and in Central America.

Chinese and Japanese people have crossed the Pacific Ocean, to find a home in the west of North America. Their numbers are greatest in California and British Columbia.

EXERCISES

1. Draw a sketch map showing the situation of the highlands of North America. Point out resemblances between North and South America as regards surface relief and rivers.

2. Account for the large number of people of negro origin in North America, saying in which parts of the continent they are found. Whereabouts are there people who belong to the yellow race?

3. Draw a map showing the natural routes from New York to the interior of the continent.

4. Refer to a map of the world, and describe how meridian 75° W. cuts the American continents. Name places near each of the tropics. Illustrate your answer with a rough sketch.

XXII. NORTH AMERICA—PART II

I. THE UNITED STATES

Fifty years ago the Americans (*i.e.* the United States people) were a nation of farmers. Farming is still very important, for there are over six million farms in the country. But the United States possesses great stores of mineral wealth and large supplies of cotton and other raw materials. The Americans are therefore able to carry on important manufacturing industries. During the last few years the number of factory workers has greatly increased. There are ten million people engaged in agricultural work, but thirteen million in factories and workshops.

Minerals of almost every kind are found in the United States. Some small coalfields are near the Pacific coast; the most important of these are near the ports Seattle and Tacoma. The Pacific region has also large supplies of gold and petroleum; both of these are worked in California. Petroleum is also found in Texas, Oklahoma and other states.

The Rocky Mountains are rich in minerals, the chief being gold, silver, copper and lead. In addition there are small coalfields distributed over a wide area from Montana to New Mexico.

The most important coal-producing areas are in the eastern half of the country. First there is the great Appalachian coalfield. It stretches for some 700 miles along the western side of the Appalachian highlands. Petroleum is also found in this region. Then

FIG 95.—THE CHIEF COALFIELDS OF THE UNITED STATES

there are two central coalfields—an East Central on the eastern side of the Mississippi, and a West Central on the opposite side of the river. Another coalfield is in the state of Michigan, between lakes Michigan and Erie.

Iron ore is present in large quantities on the eastern edge of the Appalachian coalfield. It is worked chiefly in Pennsylvania, and near Birmingham at the southern end of the region. The most important ironfields are near Lake Superior. One is on the northern side, in Minnesota, and one on the southern side of the lake, in Wisconsin and Michigan. From these fields iron ore is sent by the Great Lakes to Cleveland, and then to the great steel-making centres, Pittsburgh, Ohio and other towns.

The kind of work done by the people depends partly upon climate, partly upon situation and the distribution of minerals. The country may be divided into five regions, according to the activities of the people.

(*a*) **The north-eastern industrial and commercial region.** Most of the great industries are carried on in the area between Lake Erie and the Atlantic coast. This area has many advantages. There is a rich coalfield—the Appalachian—yielding iron and petroleum as well as coal, and, in addition, supplies of natural gas. The region lies next to the Atlantic, and is therefore well placed for trade with Europe.

Near the north end of the Appalachian coalfield stands Pittsburgh, in the valley of the Ohio. This city is the greatest steel-making centre in the world. The iron ore used in its furnaces comes from rich ironfields near Lake Superior. The Great Lakes are a very useful transport route. Detroit, on this iron-ore route, is the famous American centre for motor-cars, trucks and tractors. Several lake-side towns are also engaged in steel-making. Buffalo is one of them. It uses power from the Niagara Falls.

Nearer the sea, in " New England," are towns which manufacture cotton and woollen goods, machinery, clocks and watches. Such towns are Providence, Fall River, Lowell and Hartford. The chief trading cities are New York, Boston and Philadelphia. Each stands beside a good harbour.

New York is the greatest commercial city in America. This is due to its excellent position. Natural routes lead from its harbour to the interior. The Hudson-Mohawk valley leads to Chicago and the west. The Hudson-Champlain valley leads to Montreal. In addition, New York has good connections with the whole of the Atlantic plain.

(*b*) **The south-eastern plantation region.** This includes the southern part of the Atlantic plain, and the low land near the Gulf

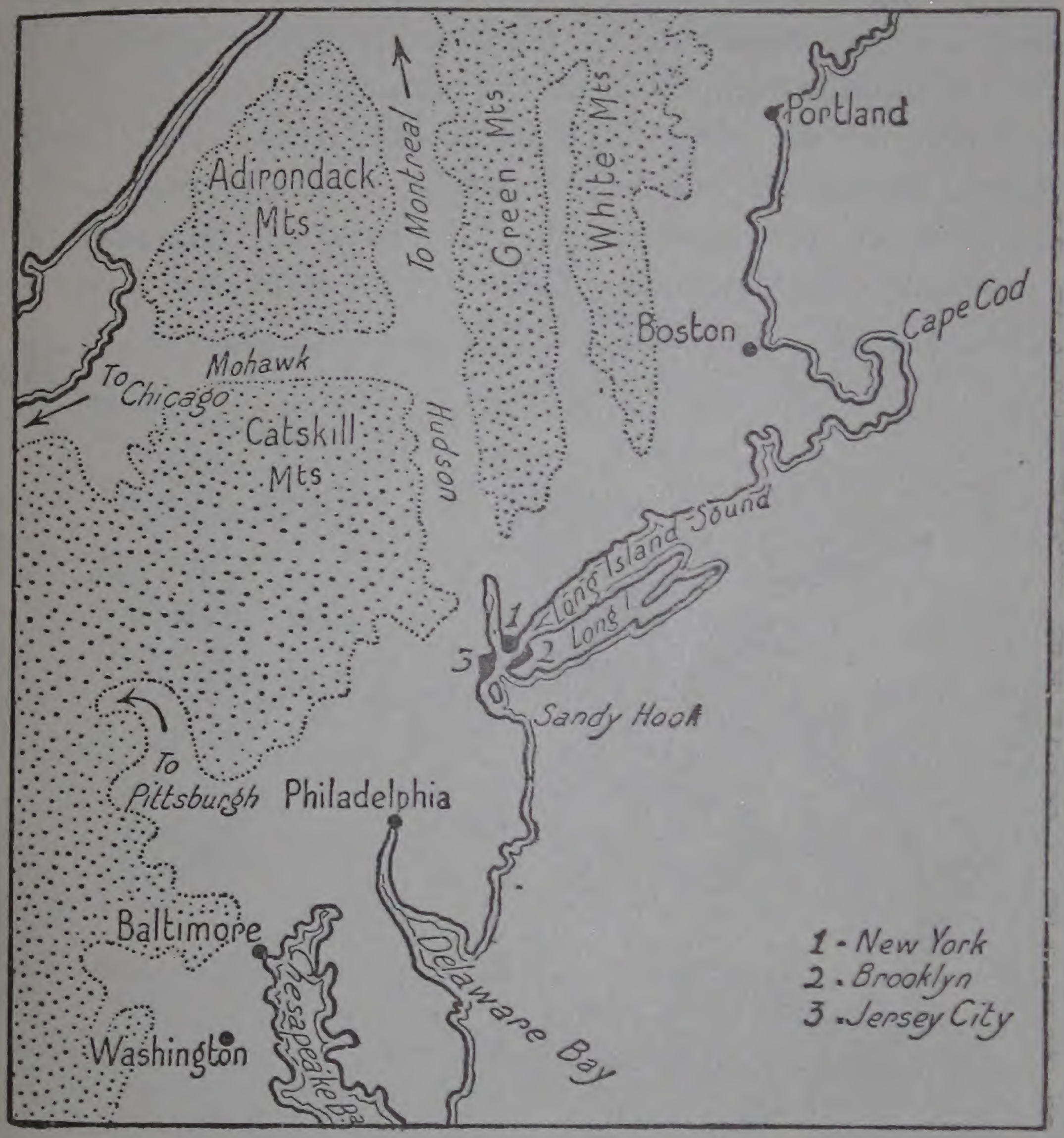


FIG. 96

New York commands the chief entrance to the United States. It is therefore the principal seaport in the country, and a terminal port for Atlantic liners. The Hudson and Mohawk valleys provide a natural route to the interior. The coastal plain allows of easy communication with a large number of towns on the coast.

The city was founded on Manhattan Island. Limited space led to the erection of " sky-scrapers," buildings 20 to 30 stories high. From Manhattan, New York has spread to Long Island and the adjacent mainland. The population of New York is 60 lakhs.

of Mexico as far as Texas. The warm damp climate makes this a region of cotton and tobacco plantations. Tobacco has been grown in Virginia for over 300 years. Kentucky is now the leading

tobacco state, and Louisville is the chief market. The rest of the region is devoted mainly to cotton-growing. Georgia produces the silky, long-stapled variety known as "Sea Island" cotton. Negroes are very numerous in these south-eastern states. Large numbers of them are employed on the plantations.

Raw cotton has long been exported from New Orleans, Galveston, Savannah and other ports. Much is now used in the factories of towns along the "Fall Line" (see page 147), and especially in Virginia. These towns have the advantage

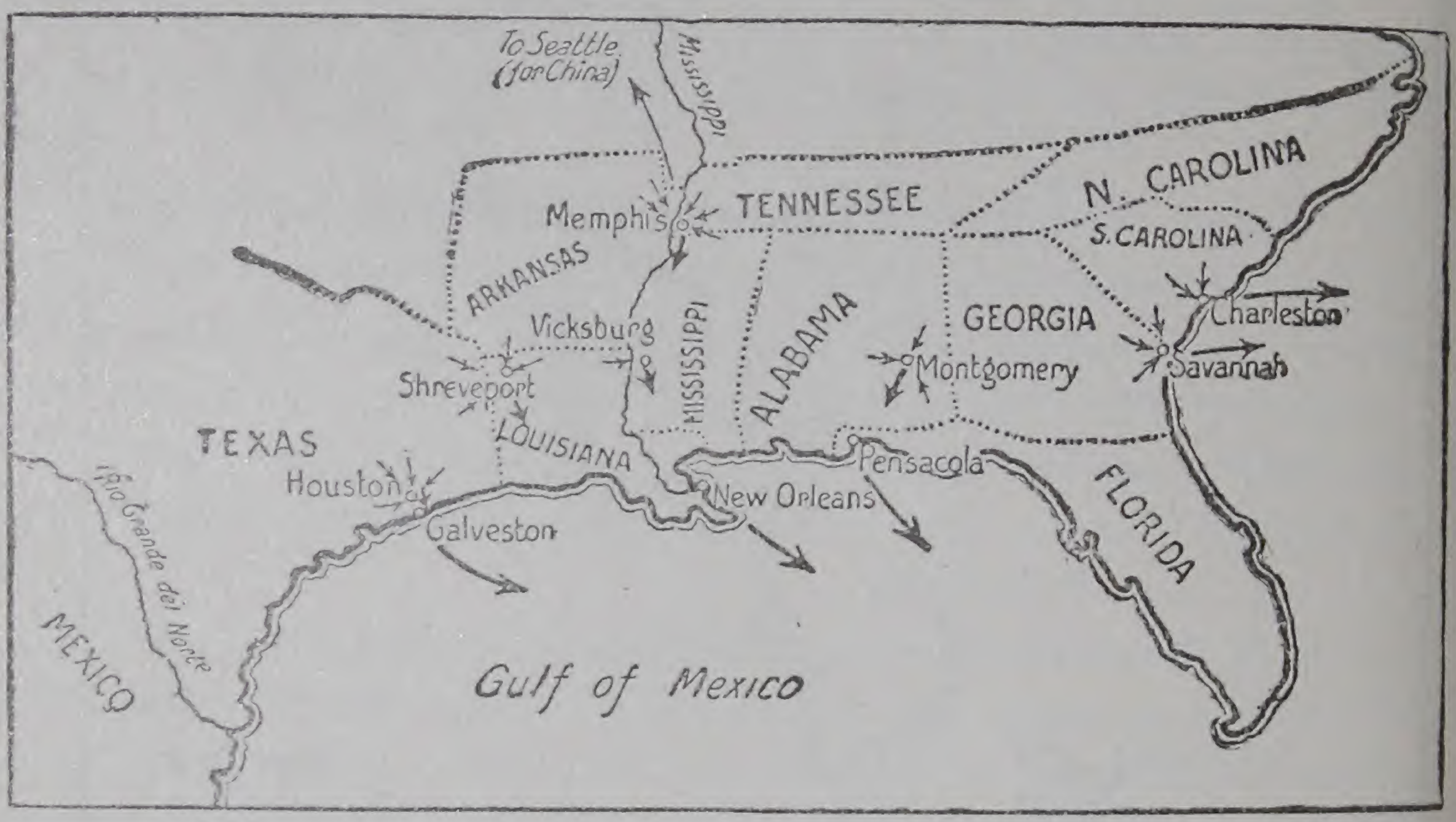


FIG. 97.

Map showing (1) the cotton-growing States of North America; (2) the chief collecting centres for raw cotton, with arrows along transport routes; (3) the cotton ports. New York is also a cotton port, and cotton is sent to Seattle for export to China and Japan.

of raw material close at hand, a damp climate that favours cotton manufacture, water-power to drive the machinery, and rivers for transport purposes.

The south-eastern states also grow much fruit, sugar and rice. The chief fruits are oranges, grape fruit and pineapples.

(*c*) **The central farming region** lies between the Appalachian highlands and the Rocky Mountains. The Mississippi plain is used mainly for agriculture, and the high plains mainly for pastoral farming. Both kinds of work are carried on in each area. (Refer to *Oxford Indian School Atlas*, p. 47.)

About 30 million people live on the plains. One-third of these are in such large towns as Chicago, St. Louis and other The

FIG. 98.—REAPING IN A PRAIRIE WHEATFIELD.

remaining 20 million are distributed over the farm-lands—a small population for so large an area. The region produces much more food than its inhabitants require for their own use. Each year the

American farmers grow about 3000 million bushels of maize, 1[illegible] million bushels of oats, 2800 million bushels of wheat. Most of this is grown in the plains. A single wheat harvest would provide bread for the farming population for several years. It is quite clear that much can be exported.

As we have noted above, the land near the Gulf of Mexico is part of the cotton-growing belt. North of this comes the **grain belt**—first maize, which requires a warm climate, and then wheat and oats. Maize is grown on the largest scale in the land between the Mississippi and the Ohio. This is very convenient for the feeding of animals which go to the meat-packing factories of Chicago.

Chicago is the "capital" of the maize belt. It has grown from a village to a city of nearly three million people in less than a century. This is due partly to its meat trade, and partly to its position on the shore of Lake Michigan. Chicago has much trade in timber, grain, and iron ore on the Great Lakes. A large coalfield just south of the city provides fuel for the engineering works in Chicago.

The second city in this region is St. Louis. It is a "confluence town." Commerce has made it great. Roads and railways focus upon St. Louis from all quarters—from the cotton plantations, the high plains, the wheat-lands, and the east.

North of the maize belt comes the **wheat belt.** Minneapolis on the Mississippi is the "capital" of the American wheat belt. It is now the greatest corn-milling town in the world. The Falls of St. Anthony provide power for the machinery in its flour mills. Minneapolis is connected by rail with Duluth at the head of Lake Superior. From this lake port large quantities of wheat and flour are exported.

On the western side of the grain belt are the **high plains.** Altitude, climate, and poorer soil make **pastoral work** more important than agriculture. Horses, cattle, sheep and swine are to be seen everywhere. Sheep are particularly numerous on the ranches near the Rockies—in Montana, Wyoming, Colorado and Texas. Cattle are seen in greater numbers on the lower ground near the Missouri. Texas has more sheep and more cattle than any other American state. The chief towns in the ranching region are Omaha and Kansas, on the Missouri. They export both meat and animals.

(*d*) **The basins and mining regions of the Rockies.** West of the high plains are many mountain ridges enclosing basin-shaped plateaux. One of these is Yellowstone Park—a National Park, one-fourth the size of Bhutan. It is a region of forest and mountain, gorges, waterfalls and geysers. Many of the basins have very poor vegetation, consisting of sage-brush and cactus. But the famous Roosevelt Dam has changed the cactus desert of Salt River Valley into good cotton-growing land. Sheep-rearing is the chief

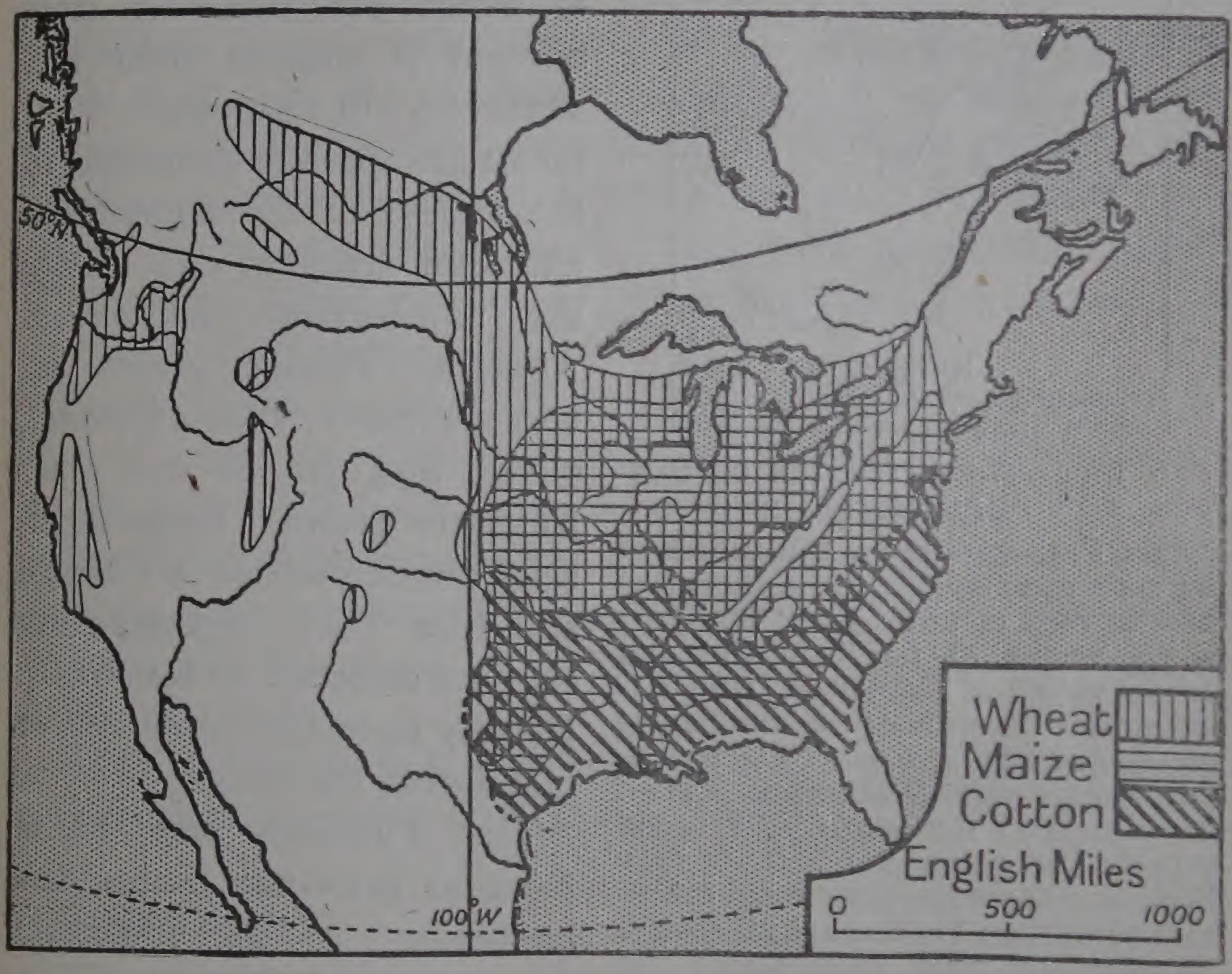


FIG. 99.—WHEAT, MAIZE AND COTTON BELTS OVERLAP ON THE SOUTH-EAST.

occupation of the farmers in this rugged land. But the whole region is dotted with workings in gold, silver, copper, lead and iron Denver in Colorado, and Virginia City in Montana, are head-quarters of the mining industry.

(*e*) **The Pacific Shorelands: Fruit, Grain, Timber and Minerals.** Gold mines drew many people to the Pacific coast in the middle of the nineteenth century. Both gold and quicksilver are still worked, and there are several oilfields in California. But mining is no longer the chief occupation. Many disappointed

gold-seekers turned their attention to agriculture. They became growers of wheat and fruit. The climate is very suitable for these crops. Summers are warm and dry, winters are mild and rainy.

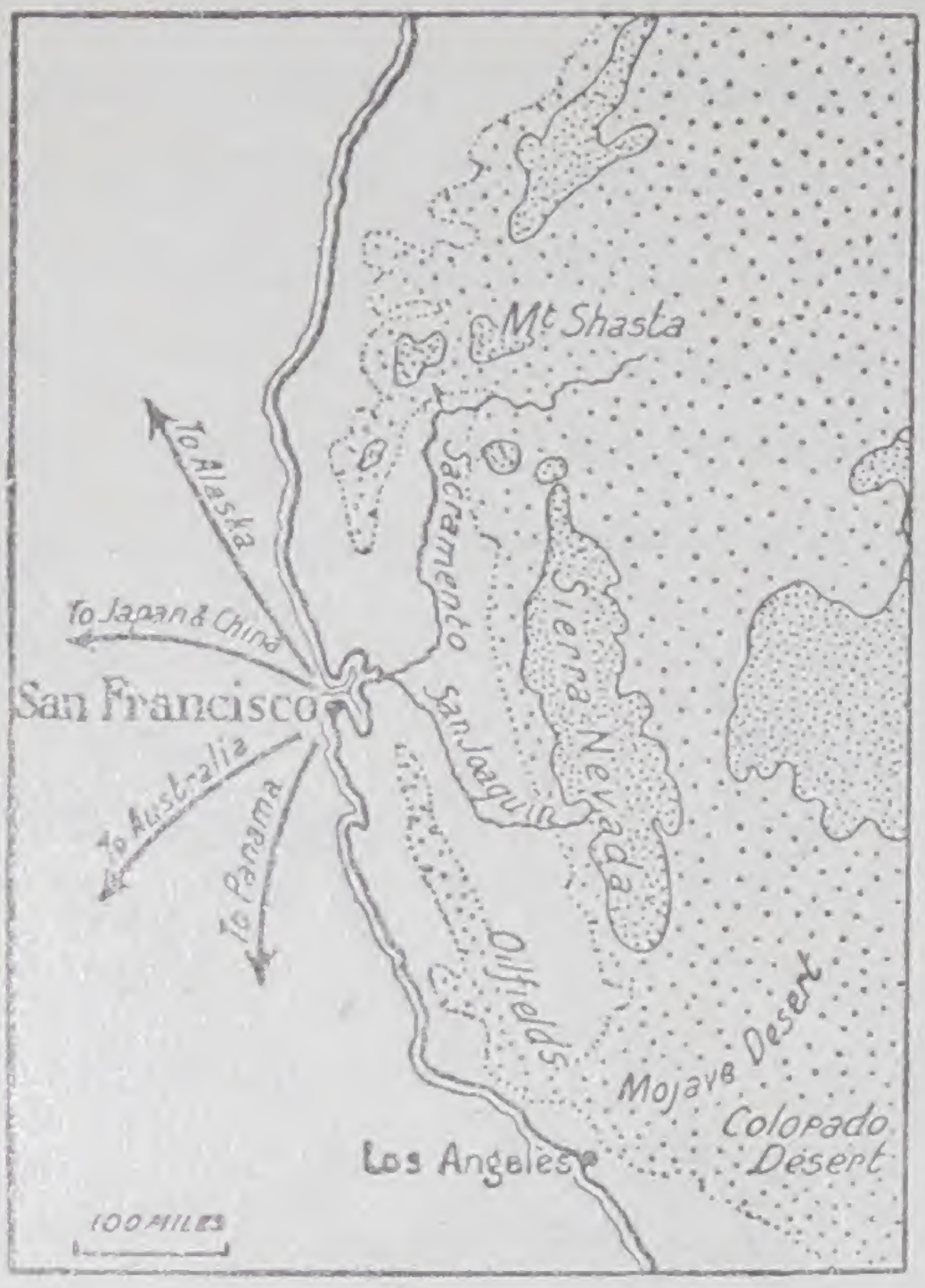


FIG. 100.—THE SITUATION OF SAN FRANCISCO.

San Francisco is on the shores of the only good harbour in a thousand mile stretch of coast-line. The port is the outlet of the beautiful and fertile valley of California, which is irrigated with water from the Sacramento and San Joaquin. The mountain forests provide excellent timber. An oilfield in the south yields good supplies of petroleum. From San Francisco there are three main routes to the interior: (1) through the Sierra Nevada and Salt Lake City; (2) through the Mt. Shasta gateway to Portland and then east to Chicago; (3) the desert route to New Orleans.

The three Pacific states, Washington, Oregon and California, raise nearly 80 million bushels of wheat per year. A large amount is shipped from San Francisco to Europe. Fruit farms are specially numerous in the valleys of the Sacramento and San Joaquin, and around the film-making centre, Los Angeles. Orange groves are very common. Plums (prunes), olives, figs, grapes and other fruits are grown. Large quantities are despatched to Chicago and New York. Special fruit-cars are attached to fast trains. Usually 10,000 car-loads are sent east during the season.

The Cascades and Sierra Nevadas grow fine timber, and lumbering is an important occupation in Oregon. Portland (Oregon) is an outlet for timber and wheat. Seattle, on Puget Sound, has an export trade in coal from a neighbouring coalfield.

II. THE DOMINION OF CANADA AND NEWFOUNDLAND

The Arctic shorelands of Canada consist of barren lands or tundras. This region is inhabited by Eskimos. Their mode of life was described in Chapter XIV.

South of the tundras there is a belt of forest which stretches across the country. The forest can hardly be said to be peopled. But there are many animals whose skins and furs have commercial value. Amongst these are the moose, red deer, wolf, bear, and the fur-bearing fox, squirrel, ermine, sable and lynx. Many natives and some white men are engaged in hunting these creatures. To travel over deep snow they wear wide flat snow-shoes—spoon-shaped frames with a network of hide. Dog-sledges are used for land journeys and birch-bark canoes for river travel. There are no railways in the north. Bundles of furs are taken by sledge or canoe to Hudson Bay Company's stores, which are to be found at various points in the northern wilderness. Perhaps this old-established occupation will decline. There are many successful "fur-farms" in Prince Edward Island. Fur-bearing animals are reared in captivity. Thus skins can be obtained without the dangers and hardships of the trapper's life.

Nearly all the people of Canada live in the southern belt of the country. Even there the population is not dense, but about 100,000 people from other lands enter the country every year. The great railways, the Canadian Pacific and the Canadian National, pass through the southern belt from Atlantic to Pacific. This partly explains why the people are in the south. They must have good means of transport.

Southern Canada falls into three divisions: (*a*) Eastern Canada, (*b*) the Prairie provinces, (*c*) British Columbia.

Eastern Canada.

Province.	Capital.	Nature of the country.
Nova Scotia - -	Halifax	Forested hills. Fertile valleys. Fiord coast with good harbours.
Prince Edward Island	Charlottetown	
New Brunswick - -	St. John	
Quebec - - -	Quebec	Low fertile land near the river. Forested highlands to the north and south.
Ontario - - -	Toronto	Low fertile land near the lakes. Forested plateau in the north.

Newfoundland, capital St. John's, is an island nearly twice as large as Ceylon. It is not part of the Dominion of Canada, but it may conveniently be considered with Eastern Canada.

The Prairie Provinces.

Province.	Capital.	Nature of the country.
Manitoba - - -	Winnipeg	A vast plain, rising steadily from Lake Winnipeg to the Rockies.
Saskatchewan - -	Regina	
Alberta - - -	Edmonton	

The Pacific Province.

British Columbia -	Vancouver	Very rugged forested mountain ridges and deep fertile valleys.

Eastern Canada. The first settlers in Eastern Canada found the land covered with forest. They cut down trees, built log-houses, and set to work to prepare the ground for crops of food. Large areas of forest still remain. They contain valuable stores of timber.

Agriculture is an important occupation in all the eastern provinces. The chief grain crop is oats ; then come wheat and barley, but wheat grows better in the drier interior. More important than grain is fruit. Apples are grown in all the provinces, but specially large quantities are produced by Nova Scotia and Ontario. Ontario usually produces a million barrels of apples yearly ; but in Nova Scotia the total is nearly two millions. The Annapolis valley of Nova Scotia is like one vast orchard. The southern part of Ontario, known as the "Lake Peninsula," is a favoured region. The soil is very fertile, the summers are very warm. The Lake Peninsula is a region of fruit farms. In addition to apples, it produces grapes, olives, figs, peaches, apricots and other fruits.

Dairy Farming has developed at a wonderful rate in Eastern Canada. One reason is that Britain is a large buyer of butter, cheese and condensed milk. All the provinces have a share in the dairy industry. Ontario and Quebec are far more important than

the rest. Quebec alone has 2000 factories for the making of butter, cheese and condensed milk. How much is made? If one year's output were taken to India, there would be half a pound of butter and half a pound of cheese for every person in the country.

Timber Industries. Eastern Canada is one of the world's great timber reserves. It is drawn upon very largely by Britain and the United States. St. John in New Brunswick has a very big export trade in timber—spruce, cedar, birch and oak. The city of Quebec has been a "lumbering" centre for over a century. The development of the industry led to the growth of another centre at Ottawa, the capital of the Dominion. Huge rafts, containing thousands of logs, come down the Ottawa river when the ice breaks up in spring. In winter men are at work in the forests. They cut down trees, trim off the branches, and stack the logs beside the frozen river. During this season they live in wooden huts. The logs are floated down to a saw-mill or pulping-mill, worked by power from waterfalls. Soft wood is torn up (pulped) by machinery. The pulp is used in the manufacture of paper and "artificial silk." Newfoundland is now an important source of supply of wood pulp. Its paper-mills produce 50,000 tons of paper a year.

Fisheries. South-east of Newfoundland there is a sub-marine plateau called the Grand Banks. The shallow waters of this area are the resort of myriads of fish much valued as human food. Examples are cod, halibut, haddock and herring. Lobsters are abundant near the coast. Thousands of people in Newfoundland, Nova Scotia and New Brunswick are employed in connection with the fisheries—some in actual fishing, others in canning factories on the shore. St. John's in Newfoundland, and Halifax in Nova Scotia have much trade in dried cod, cod-liver oil, and canned lobster.

Mining and Manufactures. Until recent times the people of Eastern Canada were concerned mainly with primary production. This is still the most important kind of work. But the discovery of minerals has led to development of industries. Ontario has large stores of copper, silver, cobalt and nickel. Quebec produces 80 per cent. of the world's supply of asbestos; this is a fibrous mineral, used in making fire-proof material. Cape Breton (Nova Scotia) has beds of coal and iron.

The Ontario towns, Toronto and Hamilton, now have large steel works and engineering workshops. Farther east there are other steel and engineering centres—Sydney in Nova Scotia and Moncton in New Brunswick.

Much of the wheat grown in other parts of Canada is sent to Ontario and Quebec to be ground into flour. These provinces have almost unlimited water-power. There is a flourmill beside most big waterfalls. The chief milling centres are Fort William on Lake Superior, Port Colborne, supplied with power from Niagara, Toronto and Montreal. Montreal has an output of about 12,000 barrels of flour per day.

The Prairie Provinces. Until the beginning of the nineteenth century central Canada was known only to hunters and trappers of the Hudson Bay Company. They followed the deep trails in the prairies made by countless herds of buffalo. There were no roads made by man. The Company had a trading station at Fort Garry (Winnipeg), in the valley of the Red River. The first colony was made in this fertile valley by a number of Scottish farmers. The colony prospered, and Fort Garry developed into the market town, Winnipeg.

Later on, Winnipeg was joined by railway to Port Arthur on Lake Superior. Thus there was a route, by water and rail, from the Atlantic to Winnipeg—the Gateway of the Prairies. There followed a great influx of settlers. The Canadian Pacific Railway was carried across the country in 1886. Later on, lines now called the Canadian National were laid. New colonies then came into existence near the railways, all the way from Lake Winnipeg to the Rockies.

The people of the Prairie Provinces are engaged mainly in agriculture and pastoral work. Both kinds of work are carried on in all three provinces. Agriculture is dominant in Manitoba, pastoral work (ranching) in the elevated and drier province of Alberta. The two branches are equally important in the middle province, Saskatchewan.

This portion of Canada is one of the chief wheat-growing regions in the world. The wheat raised is sufficient for a population twenty times as large as that of the provinces themselves. Consequently there is a large surplus for export. Much is sent to England,

where home-grown supplies are far from sufficient. Wheat can be carried by water all the way from Port Arthur on Lake Superior to Liverpool. Transport charges amount to only 40 cents. (=about 1 rupee) per bushel.

Amongst the other crops grown in this great agricultural region are oats—almost as important as wheat—barley, rye, pulses (peas and beans), potatoes and turnips. A large amount of hay is produced, to feed the horses, cattle and other animals reared on the ranches.

The chief market towns of the provinces grew at the focus of roads and railways. Winnipeg, Portage la Prairie and Brandon in Manitoba, Regina and Saskatoon in Saskatchewan, Edmonton and Calgary in Alberta are focal towns. They are centres for the collection and despatch of produce. They are also centres for the manufacture and distribution of machines required on the farms.

The Prairie Provinces are not so rich in mineral wealth as Eastern Canada. Lethbridge in Alberta is a coal-mining town. Medicine Hat, also in Alberta, has large supplies of "natural gas." The gas is used to drive machinery, and Medicine Hat has become the chief flour-milling town in the west.

In 1912 the sixtieth parallel was made the northern boundary of the provinces. This gave to each an area of forest and land containing gold, copper and other minerals. The minerals are not yet much worked. Part of this northern extension is being used for the rearing of caribou and musk-oxen.

British Columbia. Mines, Fisheries, Fruit-farms and Forests. British Columbia is traversed by the Rockies, Selkirks, Gold Range, Coast Range and some smaller ridges. Transport difficulties are great. The seaward slopes of the mountains receive abundant rainfall from the westerly winds. But between the Cascades and the Selkirks there is a well-marked "Dry Belt." With the exception of this belt, the country is well forested. The Douglas fir is a common and very valuable tree.

In mines, forests, rivers and fertile valleys, British Columbia possesses enormous wealth. White population was first attracted to the country by the discovery of gold in 1854. Since then mining has been a most important occupation. In addition to gold, there

are stores of silver, copper, lead, zinc and coal. The coal is worked in the Elk River and Crow's Nest areas, and in Vancouver Island. Nanaimo is the outlet for Vancouver coal.

Next in importance to mining comes lumbering. The development of Central Canada led to a great demand for timber. This was supplied largely by British Columbia. Much is exported through Vancouver and New Westminster to China, Japan, South America and Australia.

The fishing industry has made very great progress. Many of the people employed are Chinese, Japanese or natives. Prince Rupert is the centre of an important halibut fishery. From this port large quantities of fish are sent in special cars by the Canadian National Railway to Montreal, Boston and New York. Equally important are the salmon fisheries of the Fraser and other rivers. There are over 100 fish-canning factories on the coast. The chief are at New Westminster and Seal Cove (near Prince Rupert). At the canneries people are engaged in cleaning and cooking the fish. Then it is sealed in tins for export.

Agriculture in British Columbia is carried on mainly to supply home demands. But fruit-growing has been developed for commerce. The Dry Belt, Okanagan Valley, is the chief producing area. Fruits grown include apples, grapes, peaches, apricots and plums. Both fresh and canned fruits are exported to other parts of North America and to Europe.

III. MEXICO

Perhaps because it is a volcanic region, Mexico has great mineral wealth. Silver has been mined on the plateau for many centuries. One-third of the world's annual output still comes from Mexico. Other ores worked are gold, copper, zinc and iron. There is plenty of coal of poor quality. It is used in the iron and steel industry at Monterey. Large quantities of petroleum are obtained in the coastal plain near Tampico.

Most of the Mexican people are engaged in pastoral work, agriculture or forestry. Pastoral work is almost confined to the plateau, where the climate is dry. Here cattle, horses, mules, sheep, goats and pigs are found in large numbers. The crops grown depend

upon altitude. The eastern slopes of the plateau contain three zones, as shown below :

Zone.	Productions.
Cool - - - -	Wheat and vegetables, grassland.
Warm (to 6000 ft.) -	Maize, beans, tobacco, coffee, cotton.
Hot (to 3000 ft.) -	Rubber, mahogany, bananas, sugar, cocoa, henequen (sisal hemp).

Manufactures were at one time in better condition than they are at present. They have suffered through political unrest. There are 140 cotton mills in the country—at Puebla, Mexico, Orizaba and other towns. Many were closed during a revolution. There is a large jute factory at Orizaba, and factories for linen and paper-making in Mexico city.

IV. CENTRAL AMERICA AND THE WEST INDIES

Central America contains the Crown Colony of British Honduras, and the following republics : Guatemala, Honduras, Salvador, Nicaragua, Costa Rica, and Panama.

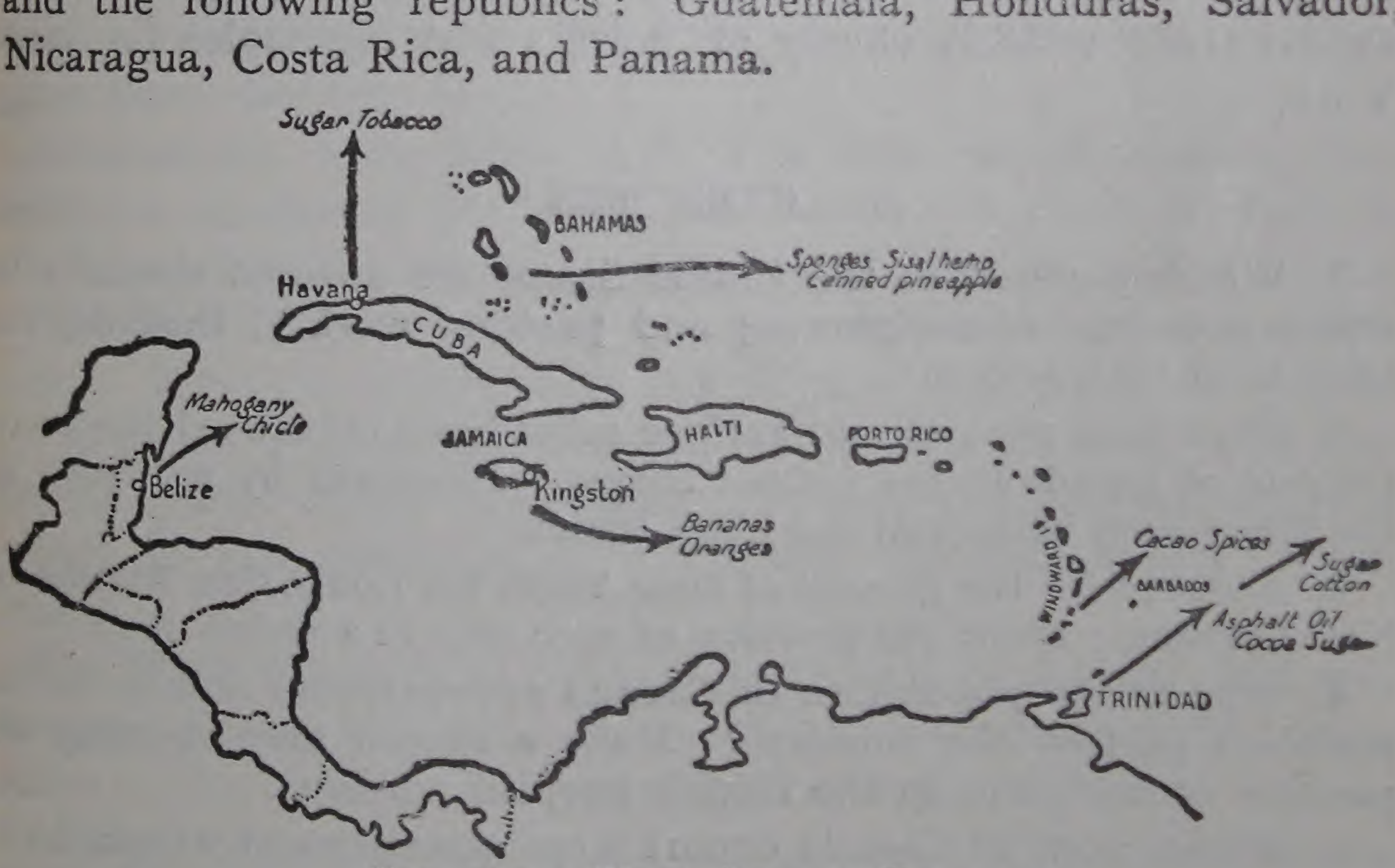


FIG. 101.—WEST INDIAN EXPORTS.

The West Indies form a broken chain on the opposite side of the Caribbean Sea. The largest islands are the republics Cuba and Haiti. The British Crown Colony, Jamaica, commands the Wind-

ward Passage. East of Haiti lies the American possession Porto Rico. Then follow the Leeward and Windward Islands, and Trinidad, most of which belong to Britain. The Bahamas, distributed between Haiti and Florida, are also part of the British Empire.

Central America and the West Indies are alike in having a hot climate with abundant rainfall. These conditions have given both islands and mainland luxuriant forests. They also make plantation work the chief occupation of the people. Bananas are grown almost everywhere. Other crops are sugar, cocoa, cotton, tobacco and henequen. British Honduras and Guatemala have a special export trade in chicle. This is gum from a tropical tree. It is used in making chewing-gum. Trinidad has mineral wealth of an unusual kind. This is a lake of asphalt, over 100 acres in extent. Large quantities of asphalt are exported, to be used in road-making. The lake seems to have inexhaustible supplies.

The chief exports of the region are indicated in the diagram.

Bermuda, a British Crown Colony in the Atlantic, is almost 1000 miles from the West Indies. The islands have a beautiful climate. They are a favourite winter resort of American people. Their export trade consists chiefly of flowers and vegetables for New York.

EXERCISES

1. Which portions of the United States are devoted specially to cotton-growing, wheat-growing and pastoral work? Describe the climate of each region.

2. Show how climate and surface relief have influenced the occupations of people in the United States. Illustrate by reference to the Mississippi basin and the High Plains.

3. Account for the growth of New York, St. Louis, San Francisco, New Orleans. Show the position of each city in a sketch map.

4. Why is the population of Canada concentrated mainly in the southern part of the country? Make a sketch map showing the position of six towns in the thickly peopled portion.

5. Which parts of Canada export large quantities of wheat. fruit, timber, fish? Write notes on the methods of transport used for each.

XXIII. AFRICA—PART I

I. SURFACE RELIEF AND RIVERS

Africa consists of three highland regions and a narrow coastal plain.

The highland regions are (1) The Atlas mountain system in the extreme north, (2) a low plateau, south of the Atlas region, (3) a high plateau in the southern portion of the continent.

The Atlas highlands consist of a series of fold mountains. They were once joined to the Sierra Nevada mountains of Spain in the west, and to the Sicilian mountains in the east. There are three separate ridges : (*a*) the **Tell Atlas**, which starts in the cliffs of Cape Spartel and runs parallel to the coast. Between this ridge and the coast there is a fertile tract of hills and valleys called **The Tell.** (Tell = heights or hills.) (*b*) **The Great Atlas**, which starts in the headland called Cape Ghir, on the Atlantic coast. It is almost parallel to the other ridges. Its highest point is 14,500 feet above the sea. (*c*) The **Saharan Atlas**, a lower ridge on the edge of the great desert (see Fig. 111).

Between the Atlas ridges there is a basin-shaped plateau, containing a number of salt lakes called **shotts.** A chain of shotts is also found in a depression extending inland from the Gulf of Gabes.

The Low Plateau extends from the Atlantic coast to the Nile valley. Near the middle there is a ridge of high land, the Tibesti Mountains. This is an extension of the high plateau. The two plateaux differ chiefly in altitude. The only special point to notice is that the low plateau is mainly desert—the Sahara and Libyan deserts.

The High Plateau is supposed to be part of a large land area that once joined Africa and India. Subsidences formed the Indian Ocean. Thus the Deccan, Madagascar and the African plateau remained, standing boldly above the sea. This explains the *regularity of the coast* of Africa. It also accounts for the *waterfalls and rapids* in African rivers. They occur where the rivers flow down the steep sides of the plateau. The great desert in the north, the unbroken coast, and obstructed rivers, were a great obstacle to

early explorers. Africa was long known as the " Dark Continent," because so little was known of the interior.

The high plateau fills the south portion of the continent, and it sends three " fingers " northward. One finger extends through Abyssinia and along the shores of the Red Sea into Egypt. Two parts of this finger are volcanic. One is in Kenya, where there are snow-capped peaks, Kilimanjaro (19,000), Kenya, and Elgon, close to the equator ; the other is Abyssinia, which is built of lava. The second finger stretches across the low plateau as the Tibesti Mountains. It is the watershed that separates the waters of the Nile from those of the Niger and Lake Chad. The third finger bends westward parallel to the Gulf of Guinea. It ends in the Futa

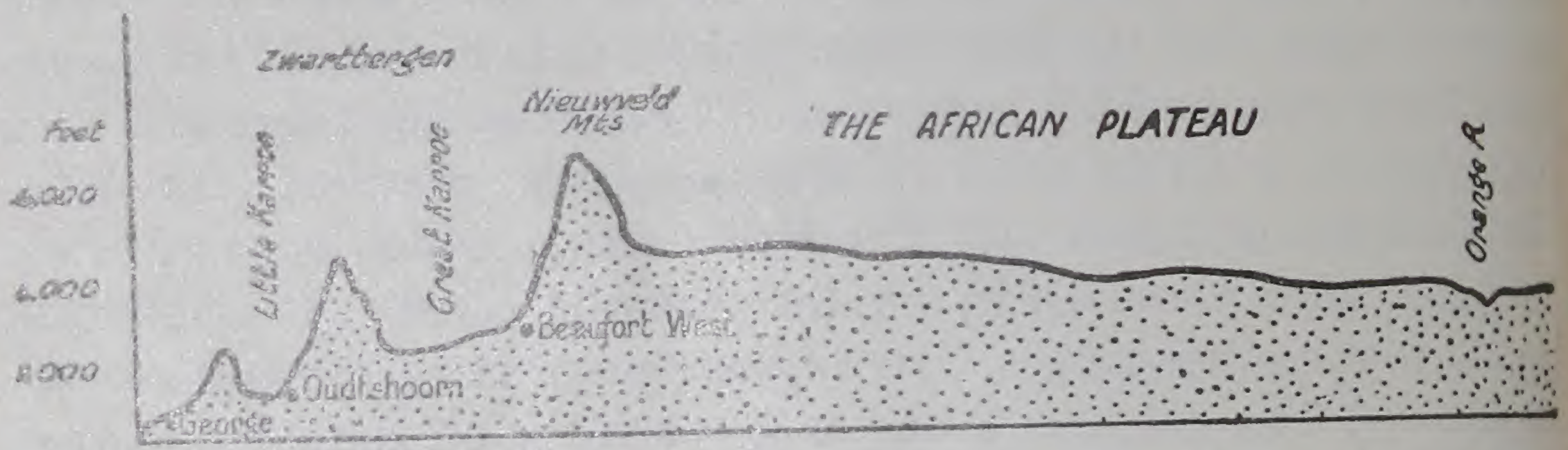


FIG. 102.—DIAGRAMMATIC SECTION OF THE SOUTHERN END OF THE AFRICAN PLATEAU.

Jallon highlands, north of Sierra Leone. This plateau finger is broken by the Niger, and its tributary the Benue. It also possesses an extinct volcano. This is Mt Cameroon, which overlooks the Gulf of Guinea. Fernando Po is a volcanic island not very far from the shore.

Drakensberg is the name given to the edge of the plateau in Natal. It stands like a gigantic wall facing the sea. It may be compared with the edge of the Deccan—the Western Ghats. In Cape Colony, the plateau descends to the sea in terraces. One terrace is the Great Karroo, and the next lower one is the **Little Karroo.**

The large lakes of Africa lie in the east-central portion of the continent. Victoria Nyanza, the second largest fresh-water lake in the world, is in a huge depression on the plateau, 4000 feet above sea-level. Its waters overflow to the Nile. Other long narrow lakes lie in the Great Rift Valley. One of these is Lake Rudolf, a salt lake in the north of Kenya and Uganda ; it is not connected to

the sea. The others are Nyassa, which feeds the Zambesi, Tanganyika, which feeds the Congo, and a chain of smaller lakes to the north of Tanganyika. Near the huge peak Ruwenzori are the smaller lakes Edward and Albert, which feed the Nile.

Africa has four large rivers : Nile, Congo, Niger and Zambesi. The Limpopo (Crocodile river) to the south of the Zambesi, and the Orange in Cape Colony, appear large on the map. They vary greatly according to the season.

The Nile is one of the famous rivers of the world. It was the "mother" of one of the earliest civilised states. Year after year, through long centuries, the Nile fed Egypt ; its waters flooded the rainless country and enabled the people to grow their corn. Only in recent times has the cause of the floods been discovered. They are the result of monsoon rains in Abyssinia. From that high plateau the Blue Nile and other tributaries bring water and sediment which fertilise land 2000 miles away.

White Nile is the name of the river which flows from Lake Victoria —a lake larger than Ceylon. On leaving the lake the Nile plunges over Ripon Falls. About 150 miles farther on are the Murchison Falls. But there are six more "cataracts" before the river finally leaves the plateau. The two Niles meet at Khartum and the Atbara joins near Berber. Then, like the Indus, the Nile flows through a dry region to the sea, without receiving any more tributaries.

The Nile floods are controlled by dams. One was built at Assuan in 1902, and another at Makwar (Blue Nile) in 1925. There are also regulating dams in the delta.

The Congo flows through the wettest part of Africa. It receives tributaries almost too many to count. It is the greatest, though not the longest, river in the continent. In Belgian Congo, the river is flowing through country like the Amazon basin. Dense forests fill the numerous valleys and mount up the sides of the hills. Between Stanley Falls, near the equator, and Livingstone Falls, 150 miles from the sea, the Congo is very useful as a waterway.

The Futa Jallon highlands receive heavy rains and send streams towards the interior. These unite to form the river **Niger.** For 2000 miles the river flows through the savannas that lie south of the Sahara. At last it finds its way through the plateau "finger." Then it flows through the dense forests of Nigeria, and enters the

Gulf of Guinea by a large number of channels lined with mangrove swamps.

The Zambesi starts in a swamp on the high plateau of Angola. First it flows in a wide shallow channel over the grass-covered plateau. At the Victoria Falls it descends a cliff 420 feet high. Below the falls the river flows through a zig-zag gorge it has cut in the plateau. The lower part of its course lies in the forests of Portuguese East Africa. In this stage it is joined by the Shiré.

FIG. 103.—THE VICTORIA FALLS, ZAMBESI R.

This river comes from Lake Nyassa—one of the lakes of the African rift valley (see page 54).

Several rivers which rise near the Zambesi flow into a large hollow on the borders of the Kalahari desert. Here their waters form a chain of marshes and salt-pans. One of these is called Lake Ngami. After rains the surplus water is carried to the Zambesi by the Chobe river. A South African scientist has proposed building a dam across the Chobe. This would make the salt marshes into a large lake. The lake might cause the climate to be damper, and it would provide water to irrigate part of the desert.

II. NATURAL REGIONS OF AFRICA

The shores of the Gulf of Guinea are lined with **mangrove swamps**. Behind these there is a belt of forest of the **selva** type. Its luxuriance is due to the hot wet climate of the equatorial low pressure zone. The forests extend in a broad belt from the river Gambia, round the head of the Gulf of Guinea to the Congo, and over most of the Congo basin. The average temperature is 80° (see Fig. 106).

If we travel northwards from this forest belt, we find the vegetation becoming less luxuriant as rainfall diminishes. Then we reach the Sudan, which is a **savanna** region. It has long periods of drought; light rains occur about the time when the sun is crossing the region. Next comes the **scrub-land**, where rainfall is deficient, and then the Sahara **desert**, which is rainless. Beyond the desert we reach, in Algeria, a region of the **Mediterranean** type, which has warm dry summers and cool rainy winters.

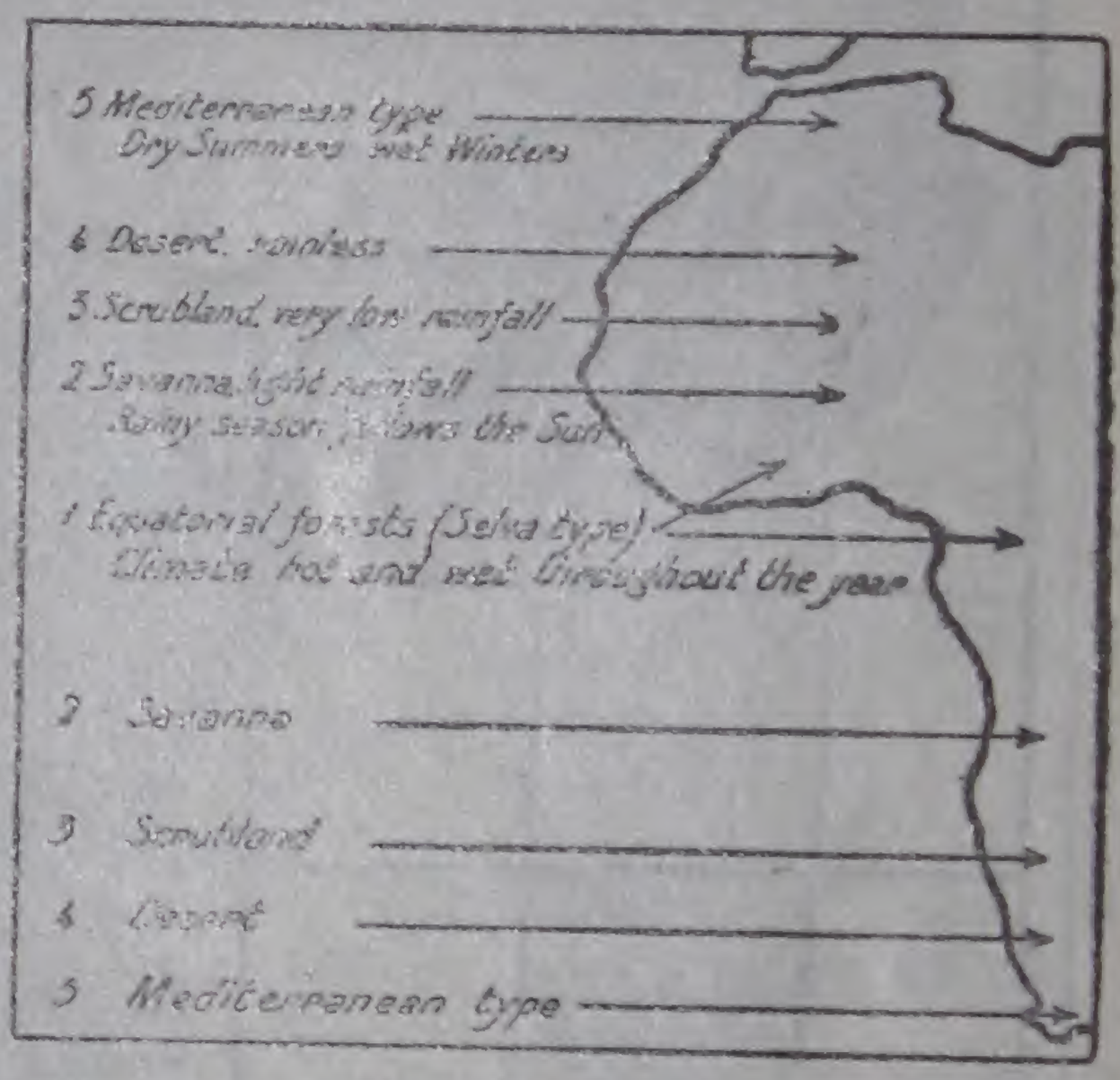


FIG. 104.—THE WESTERN HALF OF AFRICA.

Natural regions of the same type, in the same order, going northwards or southwards from the Gulf of Guinea.

Now, going south from the Gulf of Guinea, we pass through regions of the same type, in the same order—forest, savanna, scrub-land, the Kalahari desert, and finally the Mediterranean type of region near Cape Town.

The map on the following page shows that the two savanna regions mentioned are parts of one vast savanna belt. It extends through the Sudan, Kenya, Tanganyika and Central Africa. South of the Congo it covers most of the land between the Atlantic and Indian Ocean coasts. But the eastern shorelands receive abundant rainfall from the trade winds. They have therefore vegetation of a more luxuriant type, almost selva-like in character.

It will also be noticed that the northern desert stretches across the continent. Only the land near the Nile is saved from the desert by irrigation.

Another region which needs special notice is the High Veld. This is the name given to a vast area of grassland, in the Transvaal

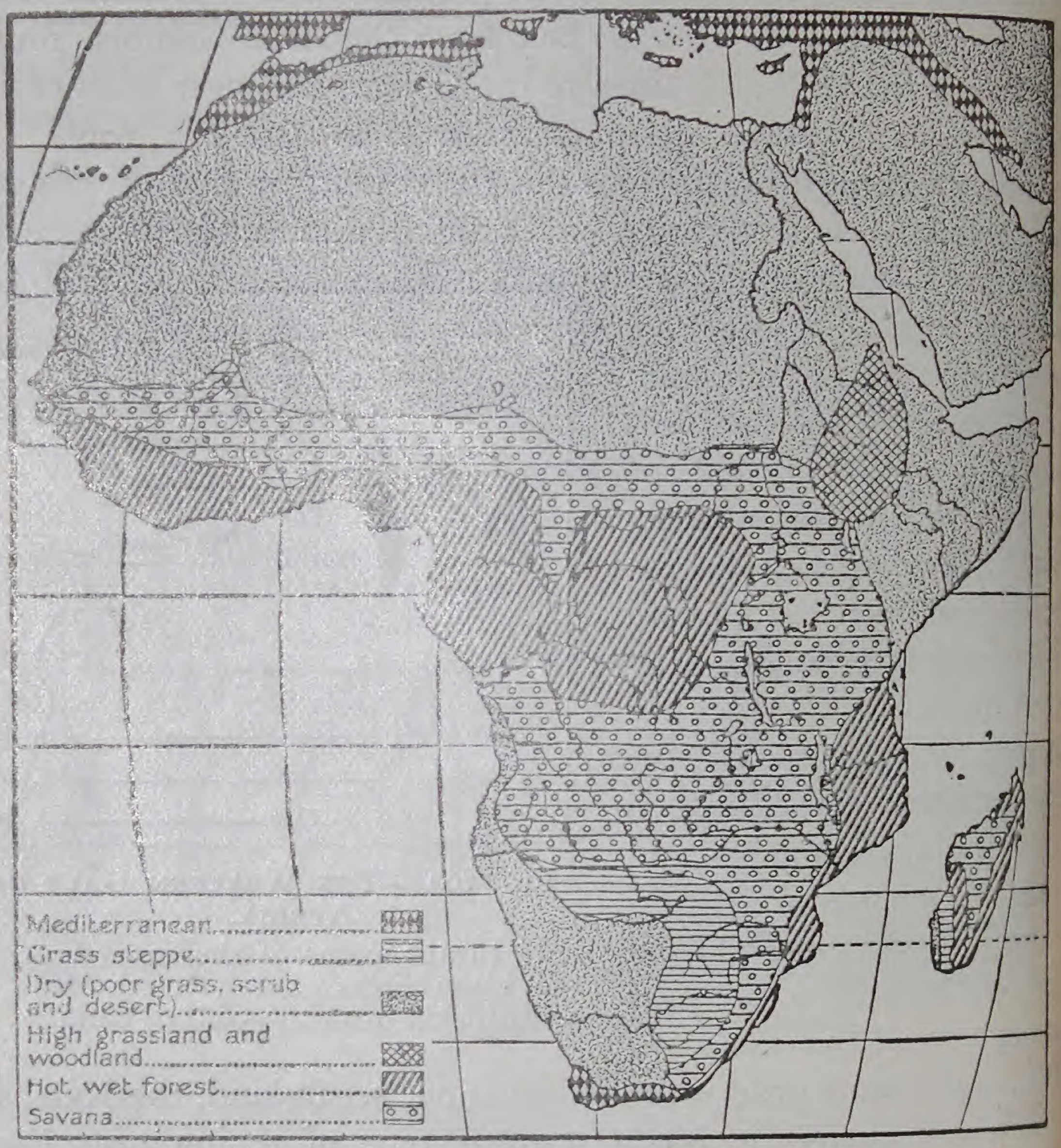


FIG. 105.—NATURAL VEGETATION OF AFRICA.

and Orange Free State. It lies at an altitude of several thousand feet, in the shadow of the Drakensberg. It is therefore a region of low rainfall and subject to great variations in temperature. These conditions suit grass better than trees, but trees are not entirely absent from some parts of the veld. Another feature of the region is the occurrence of curious flat-topped hills, called "kopjes," that rise abruptly from the surface of the plateau The veld of South

Africa is the equivalent of the steppes of Asia and the prairie of North America.

III. THE PEOPLE OF AFRICA

The northern shorelands of Africa were occupied by civilised peoples in very early times. The Egyptians were settled in the Nile region 7000 years ago. Later on the Phoenicians and Greeks established colonies in the countries now called Tunis and Algeria. Still later, Arabs spread westwards, conquering the whole of northern Africa, and making permanent settlements in Morocco.

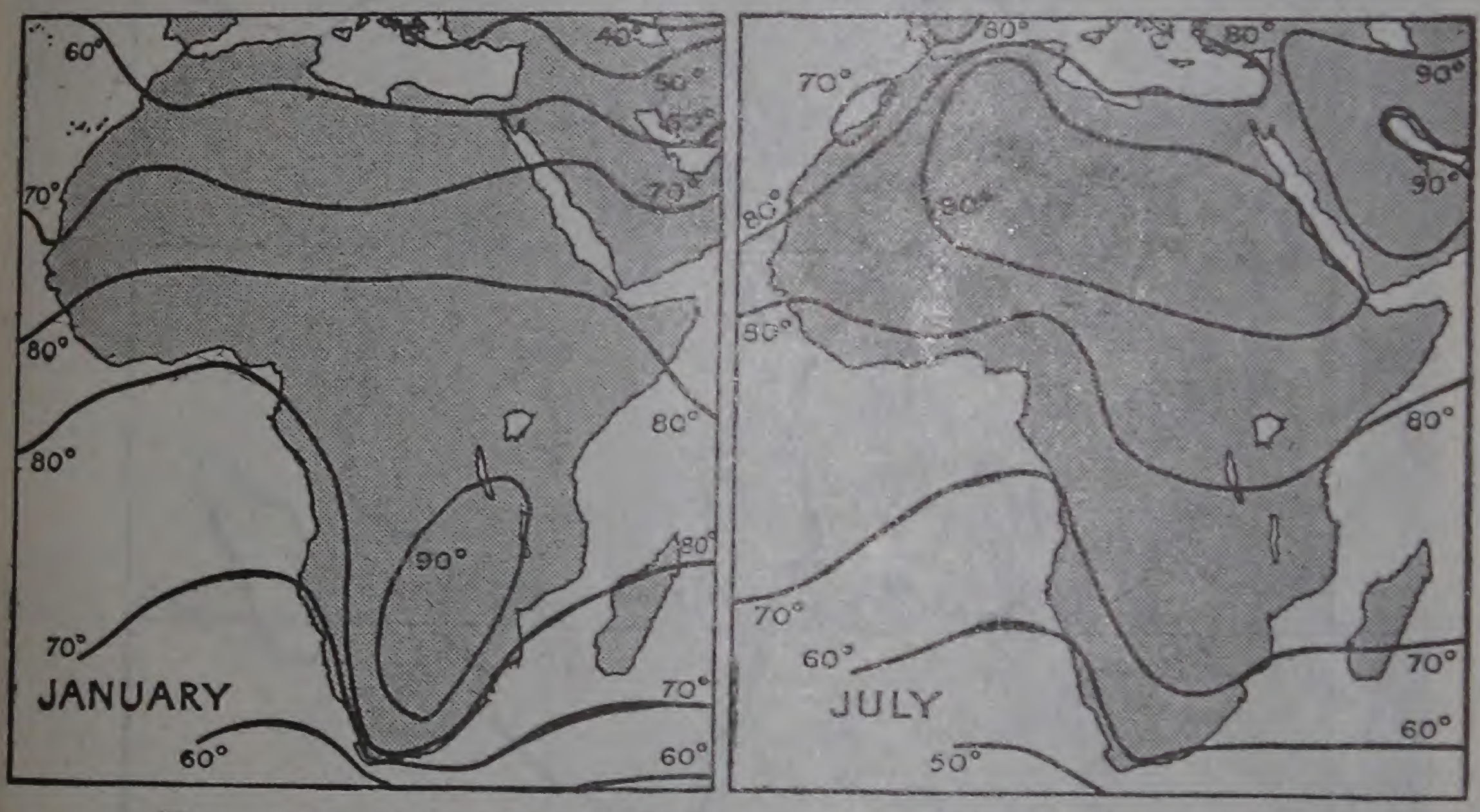


FIG. 106.—AFRICA: JANUARY AND JULY ISOTHERMS.

While these events were taking place, the negro peoples were living in the central and southern portions of the continent. Little was known about them. Less was known about the land they lived in. Even the outline of Africa was unknown until about 400 years ago.

In 1497 Vasco da Gama discovered a sea route to India by the Cape of Good Hope. This marks the beginning of European acquaintance with the southern portion of Africa. But little was known of the interior until the nineteenth century.

Europeans found the negro tribes in a very backward state. Many were less advanced than some of the Stone Age peoples. Even now there are tribes that have not emerged from the savage

state. The pigmies of the Congo forests are the most backward people in the world.

The voyage round the Cape of Good Hope, from Europe to the East Indies, used to take several months, and it involved crossing the torrid zone twice (see Fig. 107). Seamen therefore

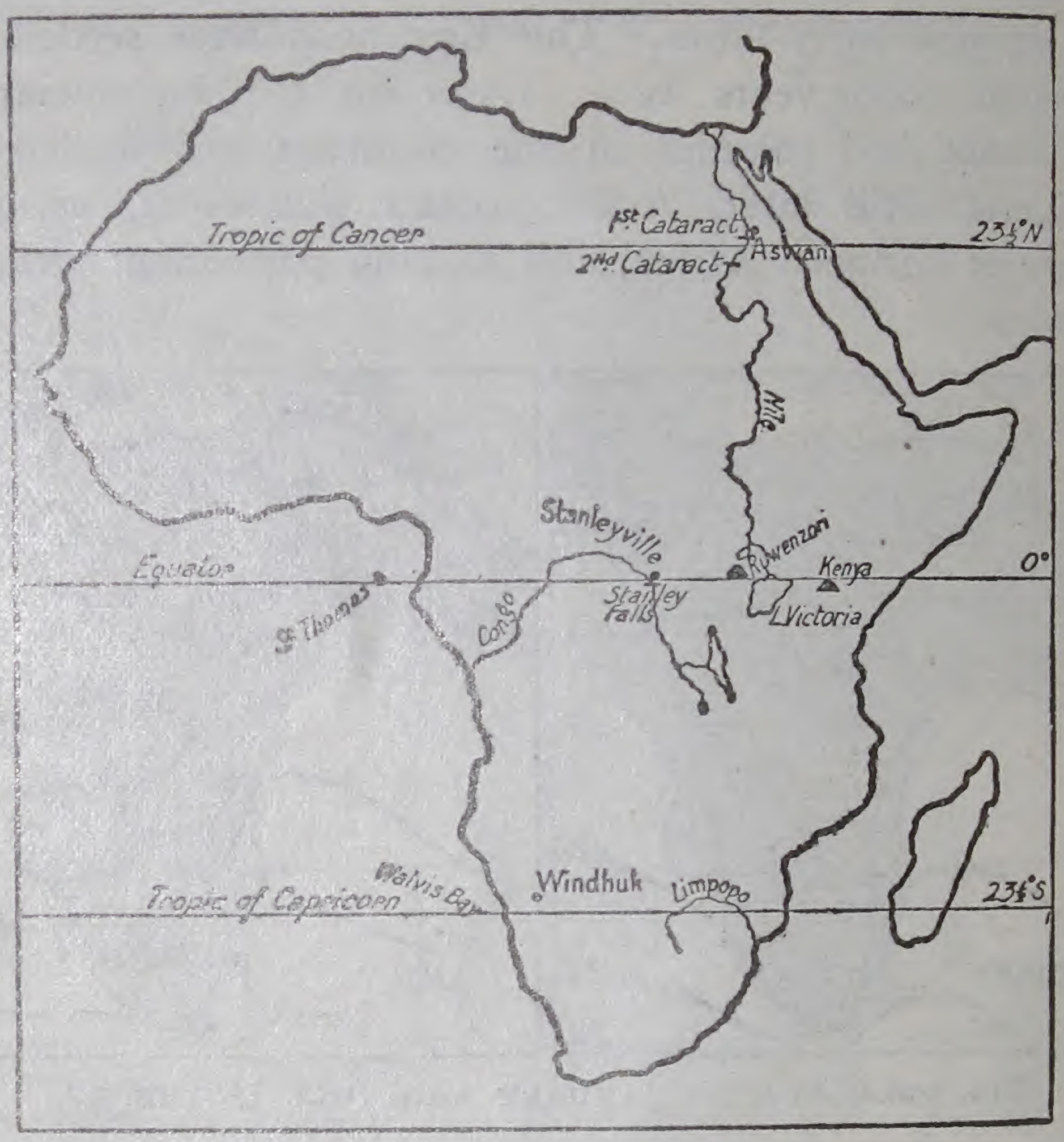


FIG. 107.—THE SITUATION OF AFRICA.

The continent is cut by the equator and the two tropics. The equator passes between Stanley Falls and Stanleyville, and between the huge peaks Ruwenzori and Kenya; it cuts the Congo in two places, and the northern part of Lake Victoria. The tropic of Cancer passes between the first and second cataracts on the Nile. The tropic of Capricorn cuts the Limpopo twice, and passes a little south of Walvis Bay and Windhuk.

required some station where fresh food and water could be obtained. The Dutch selected Table Bay. They established a calling-place on the shores of this bay in the seventeenth century. This was the beginning of European colonisation in South Africa. The calling-place afterwards developed into Cape Town.

The white settlers obtained cattle by barter with the Hottentots. They introduced European fruits and vegetables. They set to work to get rid of the lions, leopards and hyaenas which swarmed in the kloofs (gorges) of Table Mountain.

English and French colonies were established at various points. Often there were struggles with Bantu and Kaffir tribes. Hordes of savage natives would suddenly appear and sweep a lonely settlement out of existence. But the tide of white colonisation rolled steadily into the interior.

Thus was founded Cape Colony. In the beginning, its white population consisted chiefly of Dutch and British people.

Since 1806 Cape Colony has been under British rule. Many of the Boers (farmers of Dutch origin) were dissatisfied with the British policy with regard to natives. In 1836 they decided to form separate colonies. Then the northward movement called the Great Trek took place. One new colony, now the Orange Free State, was formed on the veld, between the Orange and the Vaal. Another, the Transvaal, was formed on the veld north of the Vaal. Both are now part of the British Empire. These states, with Natal and Cape Colony, constitute the Union of South Africa.

Basutoland lies amongst these states. It is really a native reserve. Europeans are not allowed to own land in Basutoland. The Basutos are the most enlightened of South African natives. Their numbers have increased from 40,000 to 50,000 in a century.

British territory extends northwards through Rhodesia, Nyassaland, Tanganyika (formerly German), Kenya and Anglo-Egyptian Sudan. Thus the whole of the eastern side of Africa, to the borders of Egypt, is under British rule, with the exception of Mozambique (Portuguese), Italian Somaliland, Eritrea (Italian) and Abyssinia (Italian).

On the western side, South-West Africa is for the time being under the Union's control. North of this is Angola (Portuguese), and Belgian Congo. The French have extended their influence south from Algeria and Morocco. They control all the western part of northern Africa except the following; Nigeria, Gold Coast, Sierra Leone, Gambia, all of which are British; Liberia (independent negro state); Rio Muni on the shores of the Gulf of Guinea

and Rio de Oro on the tropic of Cancer, both of which are Spanish : and Portuguese Guinea near Gambia.

European powers have taken possession of the regions they now hold for the purpose of developing their resources. Only a few of the political divisions of Africa started as true colonies. In most divisions natives form the bulk of the population. In the lowlands of the torrid zone the climate is unfavourable to Europeans. Generally, the lot of the natives has greatly improved under European influence. Savage customs have gradually been abandoned.

EXERCISES

1. Make sketch maps of the basins of the Nile and the Congo Write notes on the type of region through which each river flows, giving reasons for the difference.

2. Describe the vegetation you would see in travelling from Boma at the mouth of the Congo, to (*a*) Timbuktu, on the Niger, (*b*) Durban.

3. What is meant by the Mediterranean type of climate? Explain why there is a Mediterranean region in the south as well as in the north of Africa.

XXIV. AFRICA—PART II

I. THE NILE BASIN

Egypt. The manufacture of such fabrics as linen and cotton was carried on in Egypt in ancient times. At the present day, a small portion of the population is employed in manufacturing silk, calico, pottery and tobacco. The country has neither coal nor water power. Industries cannot therefore be developed on a large scale. Most of the workers are engaged in agriculture.

Egypt is practically rainless. The only productive land is that near enough to the Nile to be irrigated. The Nile valley has been carved out of a desert plateau. It is bounded on both sides by high cliffs. Thus the area that can be irrigated is very limited. The total area of the country is 222 million acres, but only 8 million acres are productive.

In the valley, land is irrigated on the "basin" system. It is flooded to the depth of 3 feet during the flood season. Wheat, millet, barley, beans, lentils, are sown when the water has run off.

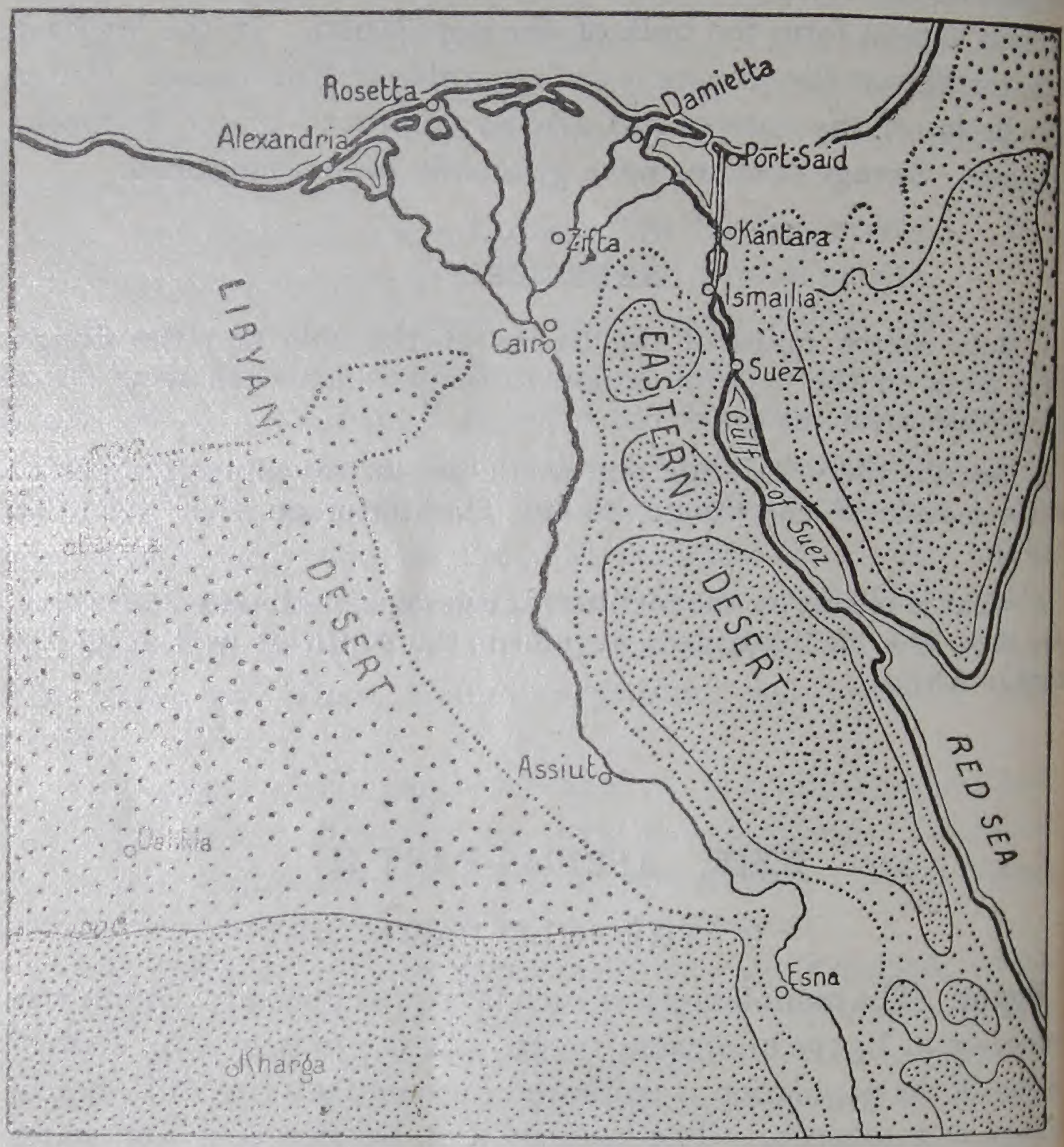


FIG. 109.—EGYPT.

Showing the small proportion of land between the desert highlands that can be irrigated from the Nile. A large portion of the valley itself has not yet been made productive.

Baharia, Dahkla and Kharga are oases.

The Delta is irrigated by the "perennial" system. This consists of a network of deep canals in which water flows throughout the year. Crops raised in this area include cotton, maize, millet, wheat,

rice, beans, sugar-cane, clover and vegetables. More than one crop of some of these can be raised in the year. It will be noticed that tobacco is manufactured, but *not grown* in Egypt. Egyptian cotton is a fine long-staple variety. It forms 90 per cent. (in value) of the total exports.

The British ruled Egypt for 42 years. During that period the irrigation system was enormously improved. One consequence of this was that the population increased from 7 to 14 millions. The great dam at Assuan was completed in 1902. Regulating dams are at Assiut, Esna and Zifta. Egypt is now independent.

Cairo, the capital, is the centre of the Delta railway system. The city is connected by rail with the ports Alexandria, Rosetta and Damietta, and also with the canal ports Suez and Port Said. Since 1918 Cairo has been connected by rail with Jerusalem. Passengers break the journey at El Kantara, and cross the canal by a ferry.

Cairo has gained fresh importance by the development of airways. It is on the Imperial Airways route to India and Australia, via Baghdad and Basra. Air routes from London to Cape Town also intersect at Cairo. (See map of Imperial Airways, p. 349.)

Anglo-Egyptian Sudan includes the middle portion of the Nile basin. The land is partly desert and partly savanna according to the amount of rainfall. North of Berber agriculture is possible near the river only. South of this there is an area with low rainfall. Here, there are poor ostrich pastures and forests of acacia. From the acacia, gum arabic is obtained. The Sudan is the world's chief source of supply of this substance. Farther south still, in Bahr-el-Ghazal, there are two rainy seasons. The vegetation is therefore richer, and the products include rubber, mahogany and ivory.

Owing to the difficulty of raising crops, many Sudanese lead a semi-nomadic life. They grow food during the rains, and move towards the Nile during the dry season. It is believed that the region could be made to grow cotton. With this object in view a dam has been built on the Blue Nile near Sennar. From this point irrigation canals will lead water into part of the Gezira—the land between the two Niles south of Khartum.

Abyssinia is a highland region between the Sudan and the Red Sea. The work done by the people depends upon where they live. Those on the high mountain slopes are engaged in cattle-rearing. Lower down there is an agricultural belt ; the crops are grain, fruit, potatoes and tobacco. In the hot valleys there are plantations of sugar-cane, coffee, cotton and rubber. The Abyssinians have little

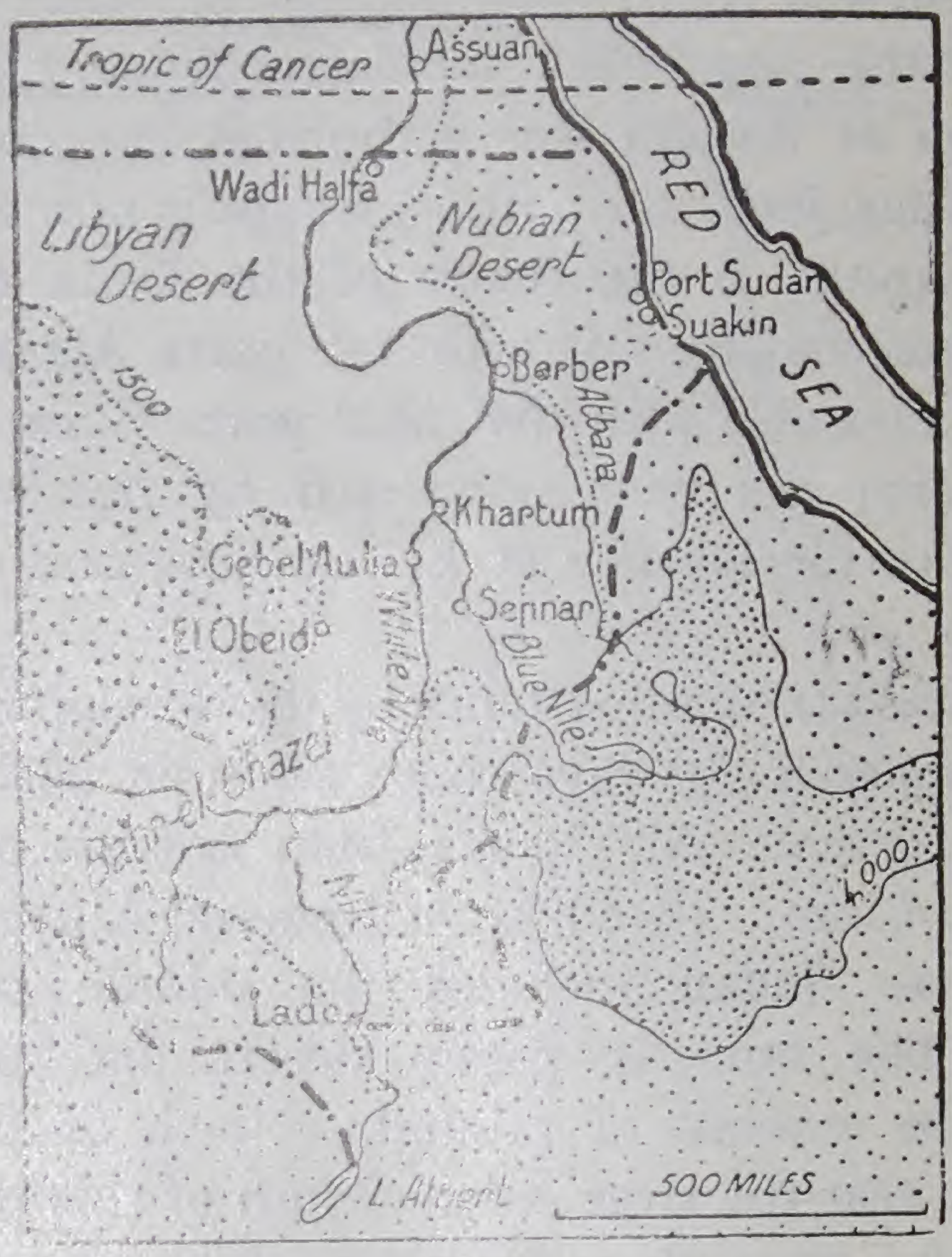


FIG. XVI.—THE ANGLO-EGYPTIAN SUDAN (BOUNDARY, –·–·–), WITH 1,500 FT. AND 4,000 FT. CONTOURS MARKED.

The main railway connects Wadi Halfa, Berber, Khartum, Sennar, and El Obeid ; a branch line from Port Sudan and Suakin joins the main line south of Berber.

foreign trade, but they export hides, coffee, and bees-wax. Slavery was not abolished until 1923. The adjoining area, **Somaliland**, is in the main a pastoral region.

II. THE ATLAS REGION

The Atlas region consists of three states, **Algeria**, **Tunis**, and **Morocco**. The first is a French colony, and the other two are French Protectorates. The three countries are alike in many

respects. Each has a fertile lowland region near the sea, and fertile valleys running back into the hills. Each has also a large area of mountain pasture, grazed by flocks of sheep and goats. Nomadic people wander over the plateau during the hot season.

The lowland agricultural region has been improved by the construction of artesian wells. Irrigation and a warm dry climate make the land very fruitful. Fields of wheat and barley may be seen in all parts of the lowlands. The people also give great attention to fruit-growing. Grapes are grown for wine-making. Most of the wine is exported from Algiers to Marseilles. Amongst other fruits are the olive, orange, fig, and date. Algiers, Oran and Tunis have a large export trade in dates. Much of the fruit is grown in the Saharan oases—Tafilet and Biskra—and sent to port by caravan. A special product of the mountains is esparto grass. It is exported for use in paper-mills.

FIG. III.—THE BARBARY STATES: MOROCCO, ALGERIA, AND TUNIS.
The dotted portion represents land over 3,000 feet.

The Canary Islands, off the Atlas coast, belong to Spain. The people are mainly fruit-growers. Bananas and tomatoes are exported to more northerly lands Teneriffe and

Las Palmas are important to seamen. They are depots for coal and oil fuel.

III. THE FORESTS AND PLANTATIONS OF WEST AFRICA

Forests and plantations extend over a large area on both sides of the lower Niger and in the Congo basin. The region has a large population, consisting mainly of negroes. The three important occupations are collection of forest products, plantation work and agriculture. A small number of people are employed in the tin, iron and lead industries of Nigeria.

Belgian Congo is Belgium's one foreign possession. The climate is hot and wet. The luxuriant forests yield valuable timber, such as mahogany and ebony. Lianas yield some 4000 tons of rubber yearly. Plantation workers cultivate the oil-palm, coffee, cocoa, and tobacco. The Congo and its tributaries provide in all 10,000 miles of waterway. Waterfalls and rapids interrupt navigation. Railways have been built to carry traffic past Stanley Falls and the rapids below Leopoldville. Banana, at the mouth of the Congo, is on a good harbour, but it is no more than a village. Ocean-going vessels sail up the river to Boma.

West Africa is a general name for the land bordering the Gulf of Guinea. Most of it is under either British or French influence.

West Africa is a region of forest, plantations and agricultural clearings. The climate of the shorelands is always hot and wet. European residents are very few in comparison with the negro population. They are mainly engaged in superintending plantation work. Large numbers of natives are employed on plantations or in collecting forest products.

First in importance amongst forest products are palm-oil and palm kernels, obtained from trees growing wild. West Africa is the world's main source of palm-oil. The oil is used as food by natives. Thousands of tons are sent annually to Britain and other lands for use in the manufacture of soap and candles The demand for this useful oil has led to the cultivation of the oil-palm on plantations in both West Africa and Malaya. Nigeria and Cameroons produce large quantities of palm-oil, and it is exported from Lagos

and Duala. The distributaries of the Niger are known to traders as the "oil rivers."

West Africa has become an important cocoa-producing region. Cacao plantations are specially numerous in Gold Coast, Cameroons, French Congo and Sao Thome. The last of these, a Portuguese island on the equator, might almost be described as one large cacao plantation.

Rubber has been obtained in large quantities in the forests. Reckless tapping has proved very destructive, and rubber plantations have been laid out in almost every colony. The result is that natives are being withdrawn from forest work to more regular employment in agriculture.

Ground nuts and kola nuts are grown in many parts of West Africa. But Gambia is the best known area for ground nuts, and Sierra Leone for kola nuts. Ground nuts are used as native food, but large quantities are exported from Bathurst.

Cotton-growing receives careful attention in Nigeria. The annual production is over 10,000 bales, and more plantations are being made. If we were to board a train for the interior at Lagos, we should travel through rubber-producing forest, and plantations of cacao trees and oil palms. After crossing the Niger we should see cotton plantations. At the end of the railway is the town of Kano.

Kano is on the savanna land. Its people belong to the Hausa tribe. The healthy climate of the savanna has produced a more vigorous type of people than those found in the forest region. They give careful attention to agriculture, growing millet, maize, wheat, rice, cotton and tobacco. The Hausas are also keen traders. For many centuries they have had caravan trade with the Mediterranean coast in the north and the Guinea coast in the south.

IV. THE EASTERN SAVANNA LANDS

The eastern savannas stretch southwards from the borders of Sudan and Abyssinia to the Limpopo river. Within the area lie the great lakes of Africa. The long narrow lakes, Rudolf, Tanganyika and Nyassa, lie in portions of the Great Rift Valley. Victoria occupies a shallow depression on the plateau.

The region we are considering is part of the British Empire. Its population is largely native, but there are many settlers from England and India. There are six colonies and protectorates, named below, with a combined area two-thirds that of all India.

Colony or Protectorate.	Capital or Chief Town.
Kenya - - - - -	Nairobi
Tanganyika - - - -	Dar-es-Salam
Uganda - - -	Mengo (Native Capital) Entebbe (British Headquarters)
Nyassaland - - -	Blantyre
Northern Rhodesia - -	Livingstone
Southern Rhodesia - -	Salisbury

The whole of this region is in the torrid zone, but most of the land has an altitude of from 4000 to 6000 feet. Hence the climate is warm but temperate, rainfall is low, and vegetation is of the savanna type.

Mozambique (Portuguese) separates Nyassaland and Rhodesia from the sea. Kenya and Tanganyika alone have a coast. In these colonies the land descends from the high plateau to the coastal plain in a series of terraces. The coastal plain is narrow, its climate is hot and wet, and its vegetation is rich and tropical. Zanzibar and Pemba are islands near the coast, similar in most respects to the coastal plain. They are interesting to traders as a source of supply of cloves.

Two portions of the savanna land may be specially mentioned. One is the northern part of Kenya. It consists of vast undulating plains, with delightful climate. At present it is occupied by nomadic native tribes and wild game. As settlement advances it may be made into cotton-growing country. The second region is the western part of Tanganyika. Here are over a hundred extinct craters of great size. The country is almost without people, but there is " big game " in abundance.

The remainder of the savanna land is being developed. There are gold workings around Salisbury and Buluwayo in Southern Rhodesia, and soda works at Magadi in Kenya. Apart from these, the region may be described as a land of farmers and planters.

Cattle-rearing is a most important occupation amongst the natives. Many white settlers have taken up the same kind of work. In addition, much attention is now being paid to ostrich farming and sheep-rearing in Kenya and Rhodesia.

Cotton-growing has made very good progress in Kenya, Uganda and Nyassaland. Kenya also grows sisal hemp on a large scale, and Rhodesia has built up a good tobacco trade. European fruit trees have been introduced into the colonies. Southern Rhodesia now exports considerable quantities of oranges. Coffee, oil-seeds, ground-nuts, rubber are amongst other products of this region.

Angola is the westward extension of the savanna land described above. The country is a Portuguese possession, governed by a High Commissioner who resides at Loanda. The population is mainly native. The products are very similar to those of the eastern savannas. But there are also large deposits of copper, iron and gold.

V. THE UNION OF SOUTH AFRICA

The Union of South Africa consists of the following provinces :

Province.	Capital.	Nature of Country.
Cape of Good Hope	Cape Town	Plateau, karroos and coastal plain ; the eastern portion is similar to Natal.
Natal - - -	Pietermaritzburg	Narrow coastal plain ; interior consists of the irregular slopes of the Drakensberg.
Orange Free State	Bloemfontein	Plateau with irregular surface, and many isolated mountain blocks called "kopjes."
Transvaal - -	Pretoria	
South-West Africa	Windhuk	Plateau, with very narrow strip of low land near the coast.

South-West Africa, formerly a German colony, is for the present governed by the Union parliament.

The high plateau almost reaches the south coast of the continent. Its end is marked by the Nieuwveld Mountains in Cape Colony and by the Drakensberg in Natal. From these ridges the land descends to the sea in terraces. In Natal the terraces are too narrow to be specially mentioned. In Cape Colony they are called the Great Karroo and the Little Karroo. The Zwarte Berg mountains separate the two karroos, and the Lange Berg lies between the Little Karroo and the narrow coastal plain.

Mining, pastoral work and agriculture are the three great occupations of people in the Union of South Africa. Natives generally engage in pastoral work and primitive agriculture, but many are employed for a period of several months at a time in mining operations.

The products of **mining** are gold, diamonds and coal. Gold is found in many parts of the Transvaal, but the most important mines are on The Rand. This is the shortened form of Witwatersrand. Discovery of gold-bearing rock in this ridge brought into existence the city of Johannesburg. Diamonds also have been found in the Transvaal, but the chief diamond centre is Kimberley, in Cape Province. Diamonds are found in patches of "blue ground," which have some resemblance to old volcanic craters. Coal is worked near Middelburg on the west of the Drakensberg, and at Newcastle on the eastern side of the mountains. Newcastle coal is of very good quality. Large quantities are sent by rail to Durban, which is a well-known coaling station.

Climatic conditions determine the areas in which **agriculture** can be carried on. These are mainly on the coastal plain, and in Natal, where there is sufficient rainfall. The crops raised include wheat and maize, the latter being an important Kaffir food. The South Africans are, however, greatly interested in fruit-growing. The district round Cape Town produces fruits of the Mediterranean type. Grapes receive special attention, and they are used for a flourishing wine industry.

Natal has a damper climate than the rest of the Union. It is therefore the chief agricultural province. The country has three zones: (1) a hot coastal zone, producing sugar-cane, tea, and such fruits as the pine-apple and orange; (2) a temperate zone, where cereals, apples, and plums are grown; (3) a high pastoral zone, devoted

FIG. 112, CAPE TOWN AND TABLE MOUNTAIN.

largely to sheep-rearing, but also yielding grain. Much of the fruit grown in this province is made into jam. But Natal has found a good market for fresh fruit in England; it is conveyed in cool chambers on ships. Hard fruits are wrapped in tissue paper, and soft fruits, such as grapes, are packed in wood-wool.

Durban, the great port of Natal, is also an outlet for Transvaal and Orange Free State. It is connected with these provinces by railways through passes in the Drakensberg.

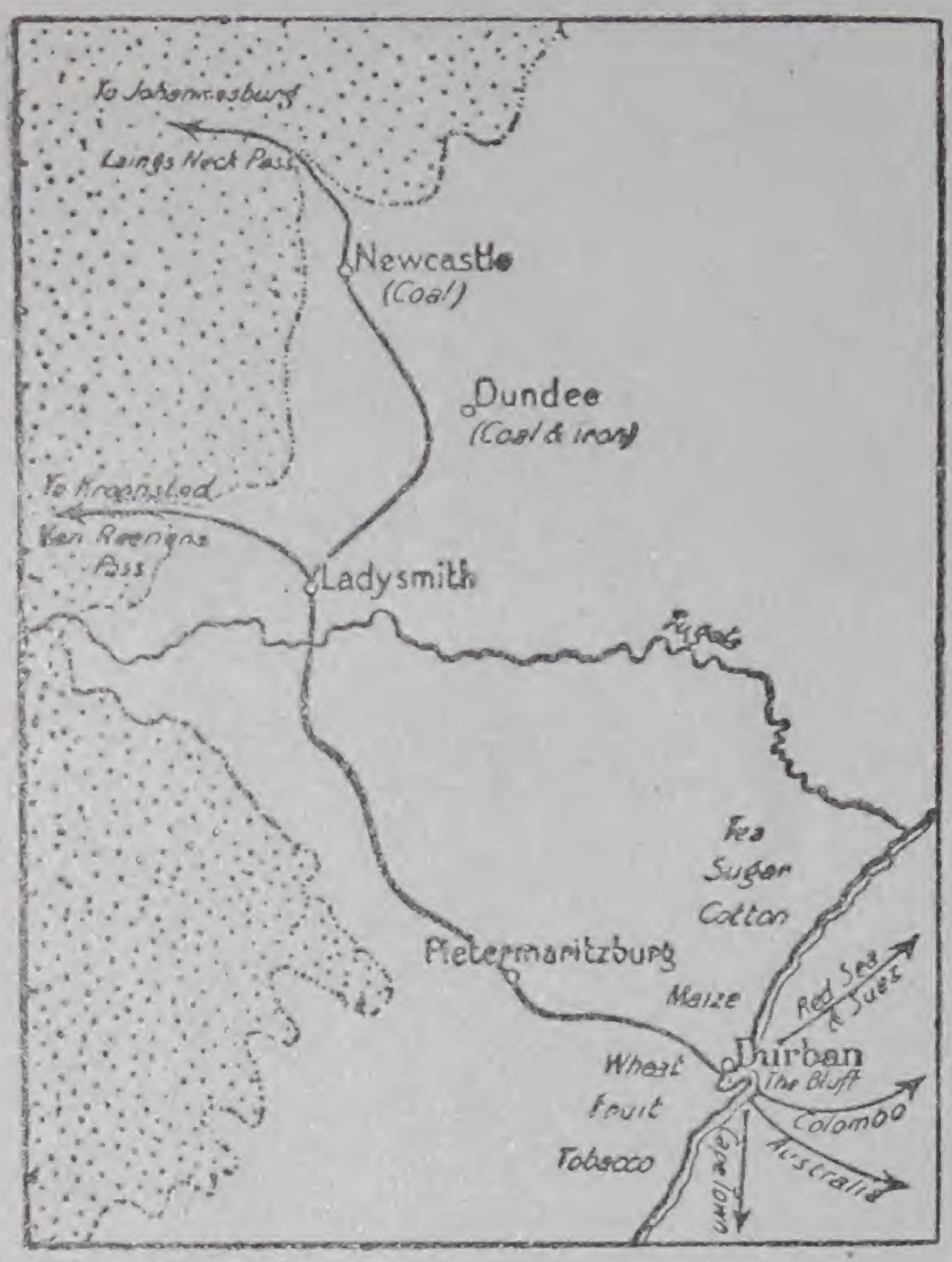


FIG. 113.—SKETCH MAP SHOWING THE POSITION OF DURBAN AND ITS LINES OF COMMUNICATION WITH THE INTERIOR.

The port is the outlet for plantation and agricultural products of the plain and the pastoral products of the mountains. The coal it supplies to ships comes from Newcastle. (The dotted area is the Drakensberg.)

Pastoral work receives great attention in the drier parts of South Africa. The Little Karroo is famous for its ostrich farms, especially in the district round the great feather market, Oudtshoorn. The vegetation of the karroos is hardly suitable for cattle, but sheep and goats are found there in large numbers. Both cattle and sheep are reared extensively in the eastern part of Cape Province. Grahamstown is the centre of the wool trade; East London and Port Elizabeth are wool ports.

Sheep farms and cattle ranches are also numerous on the veld in the Orange Free State and the Transvaal. The chief enemy of the pastoral farmer is the tsetse fly. This pest spreads disease amongst the herds, and makes horse-rearing impossible in some areas. West of the Transvaal there is a large area of poor grassland and desert called the Bechuanaland Protectorate. The Bechuanas are a pastoral people, specially concerned with cattle-rearing.

Great efforts have been made to carry on agriculture in the dry karroos and veld. Artesian wells have been bored, and reservoirs

constructed to store water. Some Transvaal farmers have adopted the method of "dry-farming." Seeds are sown in damp soil, which is kept moist for a long time by a surface layer of dry earth.

EXERCISES

1. Describe the methods of irrigation used in Egypt, and name the principal crops grown.

2. Give particulars of the products of British West Africa and Kenya (East Africa). Account for the differences.

3. Name the provinces of the Union of South Africa; give a brief description of the surface of each province, and the kind of work done by the people.

4. Explain the terms, karroo, veld, rand, saying where each region is situated.

XXV. AUSTRALIA

I. SURFACE RELIEF AND RIVERS

Australia has three physical divisions: (1) The Eastern Highlands, (2) The Central Plains, (3) The Western Plateau.

The Eastern Highlands form a mountainous tract of country, stretching from Cape York to Tasmania, with a single important break at Bass Strait. The main watershed, the Great Dividing Range, is almost parallel to the coast. In New South Wales it has special names—New England Range in the north and Blue Mountains in the south. In Victoria it is known as the Australian Alps. Here are the highest peaks in the continent, Townsend and Kosciusko, over 7,000 feet.

The seaward slope of the highlands is very steep. The rivers which flow down it are short and swift. They have cut deep gorges in the mountains. A narrow coastal plain lies between the mountains and the sea. This is the most densely peopled part of the continent. The landward slope falls away more gently to the great plains. It sheds towards the interior a large number of rivers, most of which join the Darling or the Murray. The rivers vary greatly in volume during the year; the landward slope has less rainfall than the seaward side

The Great Plains extend across the continent from north to south. They are divided into three portions by the Selwyn Range and the Grey Range. The Selwyn Range turns a large number of small rivers into the Gulf of Carpentaria. The Grey Range divides the basin of the Murray-Darling from the Lake Eyre basin. The rivers flowing to **Lake Eyre** look important on the map. But their waters often fail entirely. The lake then becomes a sea of mud. Lake Eyre is 40 feet below sea-level; its waters and those of lakes Torrens and Gairdner to the south are salt. The Murray-Darling is the only important river system in Australia. The richest part of the Central Plains is the **Riverina.** This is the land watered by the numerous tributaries of the Murray. A drier region in the lower part of the Murray basin is known as the **Mallee Lands.** It was once covered with dense scrub, consisting mainly of low-growing trees called mallee (eucalyptus).

The Western Plateau has an uneven surface with an average altitude of about 1500 feet. The uneven surface is the result of wind action and changes in temperature, for rain and rivers are seldom seen. After rains old river channels carry water, and hollows become lakes of mud or salt water. But the climate is dry everywhere except in the southern part of the coastal plain. The streams soon dry up; the lakes disappear, and in their places are stretches of parched clay. The coastal plain in the west is wider than that in the east of the continent. But its coastline is almost without harbours, and the climate is dry everywhere except in the south-west corner. Hence the region is not so favourable for human settlement. Beside the Great Australian Bight, the plain is particularly wide—but it is desert.

The **Great Barrier Reef** lies off the coast of Queensland. It is a coral structure over 1000 miles long. The warm waters within the reef, and between Cape York and New Guinea, yield pearl oysters and trepang (sea-slugs). The latter are collected in shallow water near the reef, for export to China.

II. CLIMATE AND VEGETATION

The tropic of Capricorn passes through the Macdonnell Range, which is near the centre of the continent. Parallel 40° S. passes through Bass Strait, and 10° S. is just north of Cape York. Thus

Australia lies in nearly the same latitudes as India does in the northern hemisphere. But Australia is an island. Its climate is therefore more equable than that of India. Southern India and northern Australia are very similar as regards both rainfall and temperature. But southern Australia is much more temperate than northern India. This will be observed on examining an isotherm map. (Refer also to Fig. 25.)

The north of Australia is one of the monsoon regions mentioned in Chapter VII. Darwin has an average annual rainfall of 62 inches, 54 of which fall between November and March (summer). Plenty of rain is brought to the Eastern Highlands by the south-

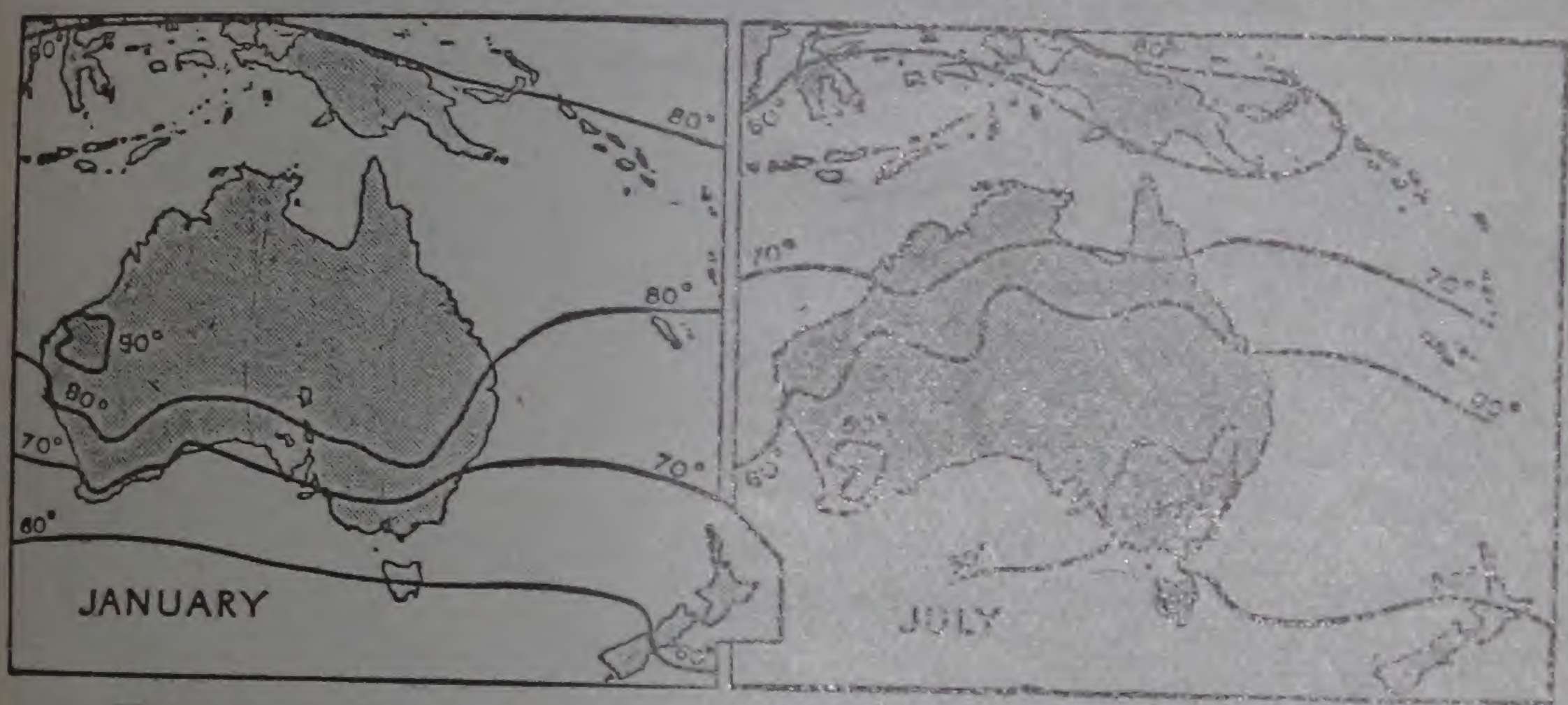


FIG. 114.—AUSTRALIA: JANUARY AND JULY ISOTHERMS.

east trades, but the Central Plain is a rain-shadow region. Thus Sydney has an annual rainfall of 48 inches, whilst Broken Hill has only 9 inches.

Tasmania, lying in the track of the westerlies, receives moderate rainfall at all seasons. The southern portions of the mainland receive the west winds only in winter, when the belt has shifted northward. Thus the south-west of Western Australia, and the south of South Australia and Victoria have most rain in winter. Their climate is the Mediterranean type. It may be compared with that of the Cape Town district. The northern part of the west coast is a sub-tropical western margin region. It is like the Atacama desert of South America and the Kalahari of South Africa. The whole plateau—with the exception of a northern strip and the south-west corner—suffers greatly from drought. Most of its surface is absolute desert.

The **vegetation** of Australia may be described briefly as follows: The northern portion consists of savanna, with tropical jungle on the shorelands and mangrove swamps along the coast. The Eastern Highlands are clothed with forest and grass. The plains are regions of steppe and scrubland. The plateau is a region of scrubland and desert, with a fringe of grassland near the sea, and forests in the south-west corner (Fig. 116).

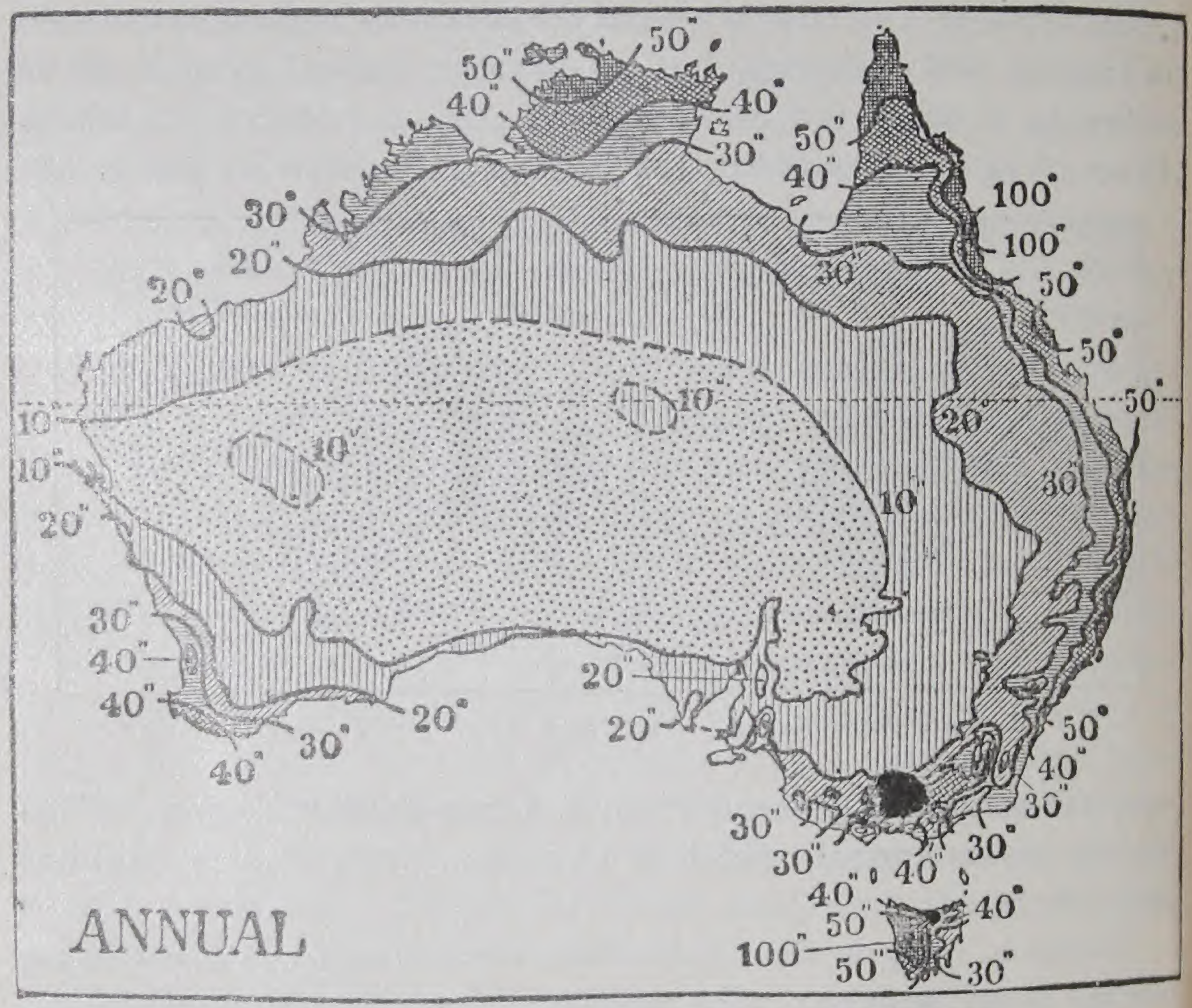


FIG. 115.—AUSTRALIA: ANNUAL RAINFALL.

The most common trees in Australian forests belong to the eucalyptus family. They are commonly called gum trees. The eucalyptus is said to be the tallest tree in the world. Many grow to a height of 400 feet. They are greatly valued for their timber, and for the oil obtained from their leaves. The jarrah and karri of Western Australia yield timber of very durable type. It is particularly useful for railway sleepers, and paving blocks for city streets. South Africa, New Zealand and Great Britain are large buyers of this timber.

Eucalyptus trees grow in the "bush" of northern Queensland. But in that area there is greater variety than in the southern forests. There are rich growths of palms, bamboos, and tree ferns, and tangled masses of creeping and climbing plants.

Scrub covers a large area in Australia. One type is the *mallee scrub*, mentioned above as occurring in Victoria. This area is being cleared for agriculture. Perhaps its chief value lies in the tanbarks,

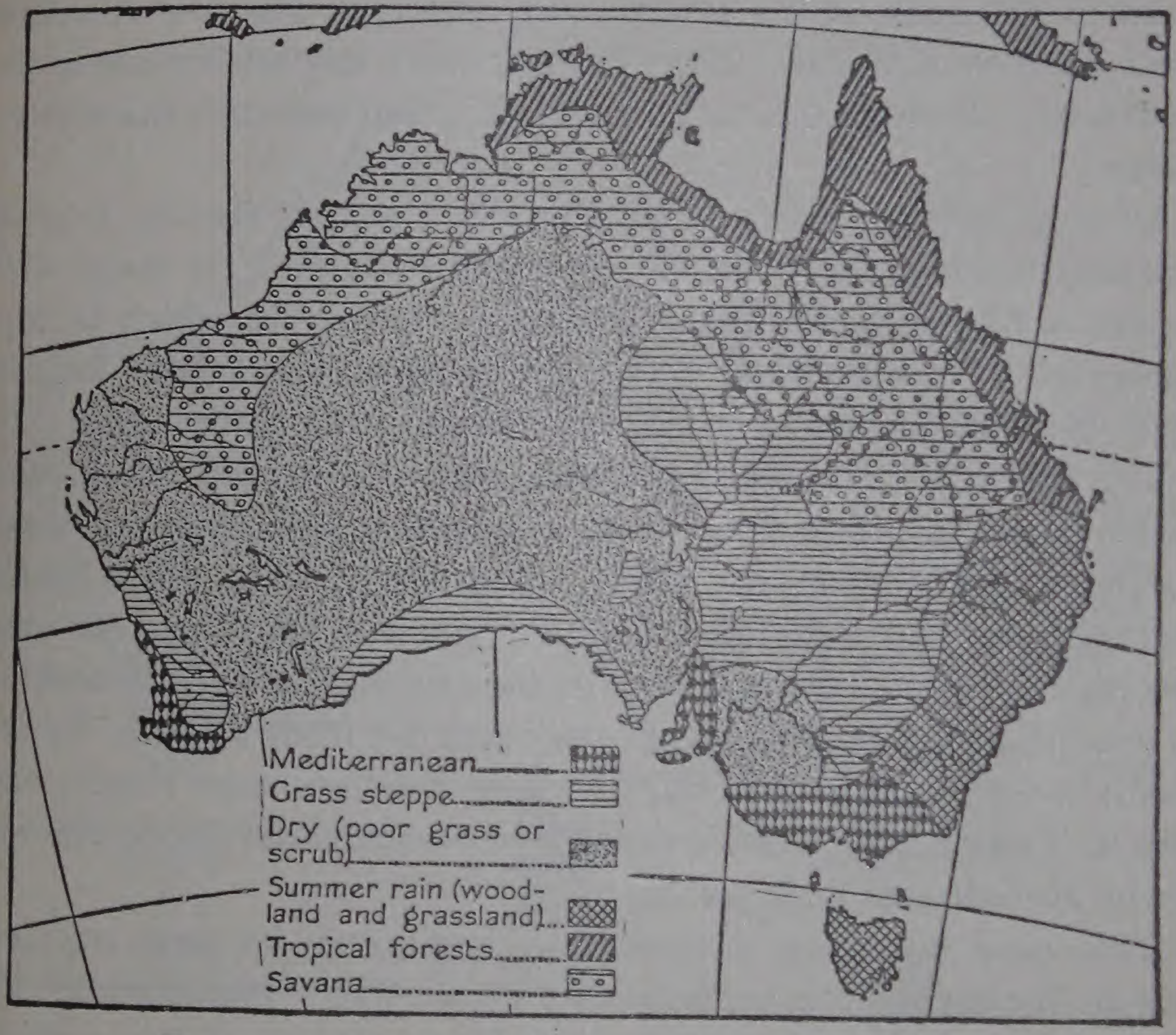


FIG. 116.—NATURAL VEGETATION OF AUSTRALIA.

obtained from the wattle (acacia), and used in tanning hides. Scrub of an inferior kind is found on the plateau, where the only vegetation that contrives to live is that fitted to withstand desert conditions—thorny plants called *spinifex*.

Before the founding of colonies, Australia was not rich in animal life. But the continent possesses types not found elsewhere in the world. Amongst these are the **pouched animals**, the kangaroo and the opossum. More remarkable still is the duck-billed platypus. This creature seems to be half animal, half bird. It has the bill of

a bird and the fur of an animal. It lays eggs like a bird, but suckles its young. It is now all but extinct. Bird life includes the emu, corresponding to the African ostrich, innumerable cockatoos and parrots, and the lyre-bird.

III. PEOPLE AND STATES

A Dutch expedition, sent out from Java, explored part of the coast of Australia in the seventeenth century. The Dutch named the land New Holland. They did not make any settlements in the continent. Perhaps this was because they had seen only the western desert.

Over a hundred years later, Captain Cook, a famous English seaman, reached the coast of New South Wales. He found that region richly clothed with vegetation. The bay in which he first anchored he called Botany Bay. Seventeen years later still, in 1788, the settlement and exploration of Australia really began.

The first settlement made by white men in Australia was a band of 700 convicts. These people were landed at Port Jackson, one of the finest harbours in the world. Provisions, tools, seeds, plants and other articles were taken ashore. Shelters for the people were erected on the site now occupied by the city of Sydney. From time to time other bands of prisoners were sent out from Britain. Settlements were made farther north, where Brisbane now stands, and also in Tasmania. The Tasmanian settlements developed into the towns Hobart and Launceston.

This may not seem a promising beginning for new colonies. But in the eighteenth century men were often "transported" for offences not now regarded as very serious. Most of the convicts made very good colonists. Those who had served their time were given a plot of land, a few animals, and rations for a year. They made a fresh start in life. They cultivated their land, increased their stock of cattle and sheep, and became prosperous farmers.

Finding a way through the Blue Mountains proved to be a difficult task. Great gullies cut by the rivers seemed to provide routes to the interior. The early settlers explored one after another, only to find them blocked at the upper end by frowning precipices.

Twenty-five years after the first landing a route through the mountains was discovered. On the western side were found wide

and fertile plains, which were soon in use for agriculture and sheep-farming. In the meantime a number of farmers drove their sheep and cattle southwards, and settled in the colony now called Victoria. Others went north and helped to found the colony of Queensland.

At about the same time the British government was forming colonies in South Australia and Western Australia. Plots of land were marked out and sold, and the city of Adelaide was founded.

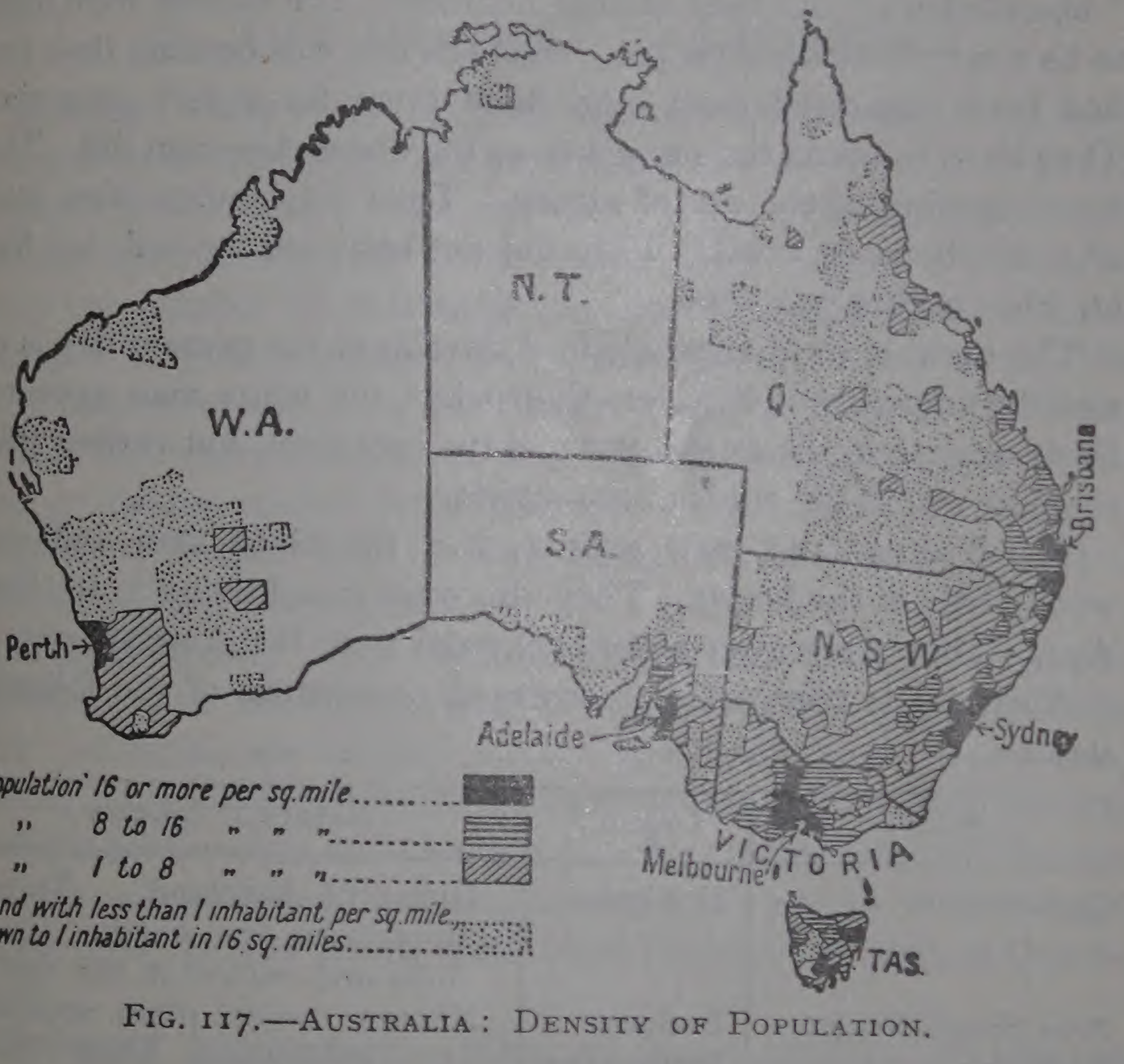


FIG. 117.—AUSTRALIA: DENSITY OF POPULATION.

In Western Australia the Swan River settlement was formed, and the towns of Perth and Fremantle were founded.

Until the middle of the nineteenth century settlers in Australia were chiefly farmers. In 1851 gold was discovered at Bathurst in New South Wales. Soon afterwards, goldfields were found near Ballarat and Bendigo in Victoria. These discoveries caused a rush of people from many lands. All were eager to make a fortune. Many were successful. Many more failed in their search, settled in the country, and became useful colonists.

At a much later date, rich goldfields were discovered in Western Australia. The chief mining centres, Kalgoorlie and Coolgardie, are on the edge of the desert. Shortage of water greatly handicapped miners in their work. There has never been in the west a gold-rush equal to that which occurred in the east.

The white man did not find Australia uninhabited. There was a small population of dark-skinned people. They are often called "blackfellows," but they are not negroes. The natives were found to be a very backward people. Perhaps this was because their land had been separated from other land areas for a very long time. They lived in much the same way as the Stone Age men did. They knew nothing of the use of metals. Their implements were made of stone, bone or wood. They did not cultivate the soil, but lived on what nature provided.

The number of aboriginals in Australia at the present day is not exactly known, but it is less than when the white man appeared. Some appear in the settled parts of the continent, but various tribes roam at will in the wilds of the interior.

The Tasmanians, now extinct, had the black skin and short woolly hair of the negro. They also were found living in the Stone Age. They were even more backward than the Australians.

Australia is now a Commonwealth, consisting of the following states :

State.	Capital.	Nature of Country.
Queensland - -	Brisbane	Dissected highland. Tropical forests in the north. Grassy hills and valleys in the south.
New South Wales -	Sydney	Narrow coastal plain, separated by mountains from rolling grassy plains of the interior.
Victoria - -	Melbourne	
Tasmania - -	Hobart	Dissected plateau. Wooded hills and valleys.
South Australia -	Adelaide	Rich plains in the south. Desert and salt lakes in the interior.
Western Australia -	Perth	Mainly desert. Grassland near the sea, and large forests in the south-west.
Northern Territory	Darwin	Forested coastal plain ; savanna and desert in the interior.

Canberra, the capital of the Commonwealth, is situated in Federal Territory. This is a tract of land in New South Wales set apart for the purposes of the capital.

The population of Australia is distributed along the shorelands of the continent. There is at present little prospect of the interior being peopled by white settlers. (See Fig. 117.)

IV. LIFE AND WORK OF THE PEOPLE

Mining. Fifty years ago, gold-mining overshadowed every other occupation in Australia. At the present day the number of people engaged in this work is comparatively small. Gold is still produced in large quantities, chiefly at the centres named above. Now, however, the number of coal miners is actually equal to the number engaged in gold digging. Each state possesses coalfields. The most important one is in the Hunter Valley of New South Wales. Where this valley reaches the coast stands Newcastle—a coal port and a coaling station for steamships. Zinc, lead and silver are worked at Broken Hill in New South Wales; tin is mined in Queensland and Tasmania.

Manufactures. The townspeople are developing their manufactures. The number of people engaged is not yet very large. The industries are located mainly in Victoria and New South Wales. The chief centres are Melbourne (textiles and engineering), Ballarat (ironworks), and Geelong (textiles and tanning) in Victoria; Sydney (shipbuilding and engineering), Newcastle and Lithgow (steelworks), in New South Wales; and Ipswich (textiles), in Queensland.

Primary production. Most of the Australian workers are engaged in some branch of primary production. During the first fifteen years of the present century the area under cultivation was increased 100 per cent. The agricultural lands are mainly along the eastern shorelands and in the valleys of the eastern highlands. There is also a large tract of agricultural land in the Murray basin, South Australia, and in the south-west of Western Australia.

The hot climate and monsoon rains of Queensland foster the growth of forests. These yield useful woods, such as "silky oak," black walnut, cedar and sandalwood. Queensland may also be

described as the plantation region of Australiia. Sugar-cane and cotton are grown extensively. There are also coffee plantations, but so far they have not been very successful.

Cereals are raised in all the states. Wheat is by far the most important. Very large areas are devoted to this grain in New South Wales, Victoria and South Australia. The surplus is exported chiefly to England, South Africa, the Malay States and the Philippines. Maize is grown in the hot moist regions of Queensland and Northern Territory. It is used largely for the feeding of animals.

Fruit-growing has developed greatly. Orchards and fruit-gardens cover twice as much land as they did twenty-five years ago. Grapes are grown in every state except Tasmania. They are used partly for the manufacture of wine, especially in South Australia and Victoria, and partly for export, either fresh, or dried as raisins and currants.

As we come southwards along the east coast we find changes in fruit-growing. Queensland has such tropical fruits as the pine-apple, mango, banana and guava. New South Wales and Victoria grow oranges, lemons, peaches and apricots, as well as large quantities of cool temperate fruits. Tasmania has a particularly large number of apple orchards. Many people in the eastern states are employed in connection with the fruit industry—drying or preserving and packing the fruit for export.

Pastoral work has been important in Australia from the time when the first colonies were established. The lowland region west of the Eastern Highlands is a vast grassland, well suited to sheep-farming. Its chief drawback is shortage of water. This has been to some extent made good by the construction of artesian wells. Eighty-five per cent. of Australian sheep are in the eastern states. More than half of these are in New South Wales. Most of the wool produced is exported to Britain, other European lands, and the United States. Both Sydney and Melbourne are outlets for raw wool. Sheep-farming is carried on to some extent in all the states.

Though sheep-farming is so important, there are large herds of cattle in every state. These are reared partly for dairy work and partly for the meat market. The finest beef-producing cattle are grazed on the savannas of Queensland and Northern Territory.

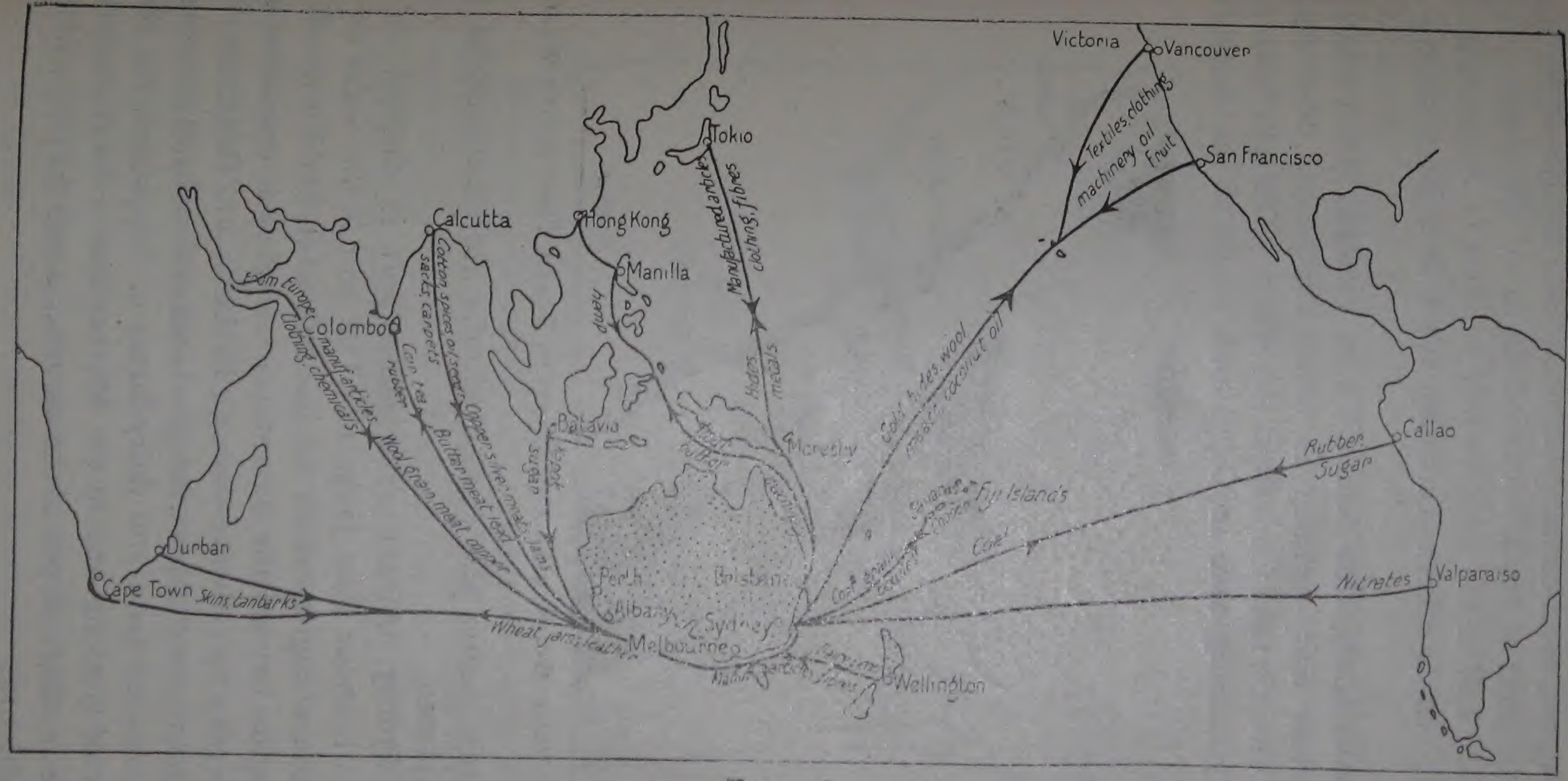


FIG. 118.

Australia is favourably situated for trading with lands around the Pacific and Indian Oceans. Australian trade with South-eastern Asia and the East Indies has increased by 600 per cent. since the beginning of the century.

Meat-freezing and meat-canning factories find employment for many people. This kind of work is carried on in all the eastern states, but more than half of the meat-factory workers of Australia are in Queensland. In Northern Territory there is a large factory at Darwin.

In the cooler lands, New South Wales, Victoria, South Australia and Tasmania, dairy-farming is more important. New South Wales and Victoria take the lead in this work. The latter state has a rich dairy-farming area in Gippsland, south of the Australian

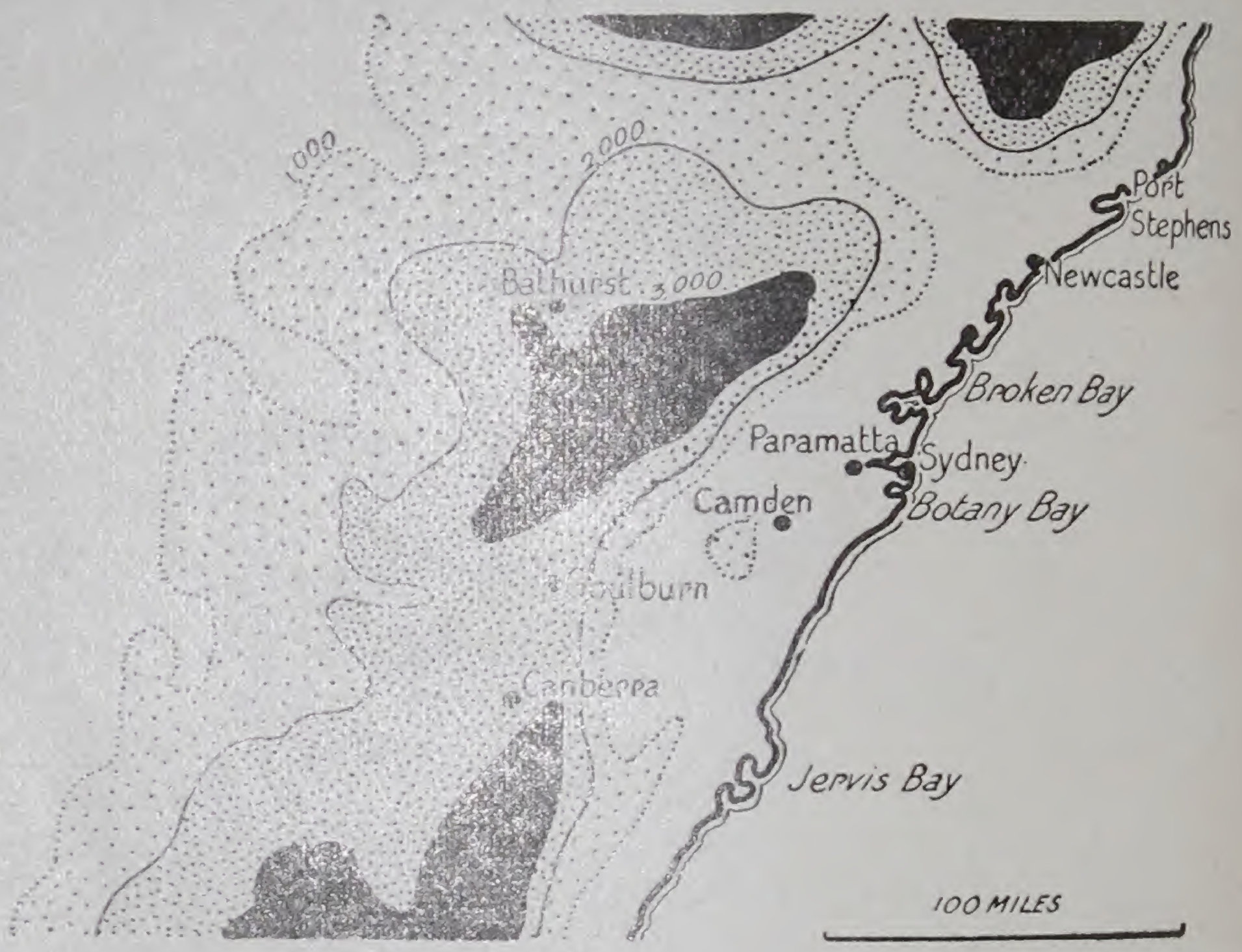


FIG. 119.—BLUE MOUNTAINS AND COASTAL PLAIN, NEW SOUTH WALES.

Alps. Cheese, butter and condensed milk are manufactured, and much is exported.

Ports. Sydney, Australia's greatest port is situated on the magnificent harbour Port Jackson. The port is the outlet for the rich agricultural region which lies just behind it, and for the sheep-farming region beyond the mountains. Sydney is connected with the latter region by railways through Bathurst and Goulburn.

Melbourne, the second port, has good connections in all directions—with the timbered land and dairy-farms of Gippsland, the sheep-farms west of Geelong and in the Murray basin, the fruit-growing area on the northern slopes of the mountains and the irrigated fruit-farms of Mildura.

Brisbane has not the best natural harbour in Queensland, but a valley behind the city leads to a coalfield and the industrial town Ipswich.

Townsville and Rockhampton, farther north, are ports for the gold-mining areas in the mountains.

Adelaide and Port Adelaide, on the Gulf of St. Vincent, and Port Augusta on Spencer Gulf, are the outlets for the wheat, wool, and copper of South Australia. **Perth**, on the Swan River, and **Fremantle**, at the mouth of the same river, serve the gold-mining region

FIG. 120.

Melbourne is situated on the shores of Port Phillip, opposite Kilmore Gap in the mountains north of the city. Port Phillip is the natural entrance to Victoria. Kilmore Gap facilitates communication with the fruit-growing and sheep-farming regions north of the mountains, and with the northern capitals, Sydney and Brisbane.

of Western Australia. Albany, on the south coast, near the West Australian forests, is the port for a developing agricultural region. **Hobart**, on the river Derwent, and **Launceston**, on the Tamar, are the two towns of Tasmania. Hobart is both an industrial centre and a seaport.

The Australian capitals are connected by a **trans-continental railway**. Unfortunately the lines in the different states are not uniform in gauge Consequently it is impossible to run through

trains. In any case breaks are desirable on so long a journey. The journey from Brisbane to Perth occupies six days.

Papua (British New Guinea) is under the control of the Australian government. This territory is occupied almost entirely by coloured people. The natives are engaged mainly in agricultural and plantation work. The products are coconuts, sisal hemp, tobacco, maize, coffee, vanilla and kapok. A large portion of the land is covered with forests. These yield ebony, dyewoods and sandalwood. Gold, copper and other minerals are being worked, and a valuable oilfield has been discovered. The Europeans in Papua, about 400 in number, are either planters, miners or officials. The chief town is Port Moresby.

EXERCISES

1. Give a general account of the surface relief of Australia, and explain the effect of the mountains upon the distribution of rainfall. Illustrate your answer with a sketch map.

2. Describe and account for the distribution of population in Australia. Mention parts of the continent that are not fit for habitation.

3. Name the eastern states of Australia. Give a short description of the surface of each, and say what branches of farming are carried on in each state. Illustrate your answer with a sketch map.

4. Mention points of difference—surface relief, climate, vegetation and occupations—between the eastern and western halves of Australia.

5. Give a list of articles carried in each direction on the trade-route between India and Australia.

XXVI. NEW ZEALAND

The New Zealand group of islands lies over 1000 miles south-east of Australia. Dutch seamen discovered New Zealand over 200 years ago. It was left to Captain Cook to find that there were two large islands, separated by the strait that bears his name. Stewart Island is separated from South Island by Foveaux Strait.

About one hundred years ago, British settlers first made a home in New Zealand. They found the land inhabited by Maoris, a brown-skinned people who had come from the Polynesian islands.

The Maoris, though cannibals, were superior to the Australian blackfellows. They cultivated the soil; they built wooden huts and thatched them with grass; they made coarse material from wild flax; they were skilled workers in wood, though their weapons and tools were made of stone; their artistic ability was exercised in tattooing their bodies.

The colonists were not allowed to settle on the land unmolested. More than one fierce war was waged with the natives. Since 1870 there has been peace. The Maoris have had land allotted them in North Island; many have adopted British customs and British occupations.

South Island has two physical regions, the Southern Alps and the Eastern Plains. The western side of the mountains descends steeply to the sea. In the south many valleys have been submerged. They form **fiords**, extending inland between forest-clad mountains.

The island lies in the track of the Brave West Winds. This situation has important consequences. The west coast has frequent storms, and the west of the island has much greater rainfall than the east. Hokitika has 115 inches rainfall, and Dunedin only 34 per year. As one would expect, the mountain slopes are forested, whilst the eastern plains are clothed with grass.

Heavy snows fall on the high mountains. Mount Cook, 12,500 feet in altitude, has its summit 2000 feet above the snow-line. Around it are other peaks nearly as lofty. From these snow-clad heights huge glaciers glide into the wooded valleys below.

North Island has interesting features of quite a different kind. The mountain system of South Island is continued, after a break at Cook Strait. It ends in a headland, East Cape, beside the Bay of Plenty. West of the mountains there is a volcanic area. The only active volcano is Ngauruhoe; near to this stands the extinct volcano Ruapehu. Throughout the area there are hot springs, geysers and lakes.

Climate and vegetation. New Zealand lies between parallels 34° S. and 47° S.—equivalent to the north of China. The climate is very different from that of northern China. Wellington and Pekin have the same latitude; but whilst the average monthly temperature of the former ranges from 47° to 62°, that of Pekin ranges from 23° to 79°. The vast ocean in which New Zealand

lies renders the climate very equable. Rainfall we have already mentioned.

The influence of the climate is seen in the natural vegetation, which is largely evergreen. Many of the native plants are not found anywhere else. In North Island the kauri pine, sometimes 25 feet in girth, grows to a height of 200 feet. It provides very useful timber, but is perhaps more valued for the resin it yields. Kauri gum is fossil resin, used in the manufacture of varnish.

Lianas and flowering creepers adorn the forests. Tree ferns grow to a height of 60 feet. In the settled parts English trees, flowers and fruits are grown. Ten million acres have been sown with English grasses.

Before the white man appeared New Zealand was very poor in forms of animal life. All English domestic animals, and many English birds, have been introduced. As in Australia, rabbits multiplied at such a rate as to become a pest. Stoats, weasels and ferrets were introduced to prey upon them.

Occupations of the People. A colony of Scotsmen was founded in Otago in 1848, the population in that year being 400. In ten years the population had grown to 10,500, and in twenty years to 56,500. The rapid increase was largely due to discoveries of gold in Otago. In addition to gold, New Zealand yields silver, iron, copper, sulphur and coal. The largest coalfield is near Westport in South Island. Mining is not at present an important occupation.

New Zealand has not a large population—there are more people in Calcutta than in the whole of the Dominion. Consequently large tracts of land can be devoted to food production. **Pastoral work** is far more important than agriculture. The grass-covered Canterbury Plains in South Island provide pasture for large flocks of sheep. On these plains has arisen the town of Christchurch, connected by rail with its port, Lyttelton. These towns are important centres in the **frozen meat** (Canterbury lamb) trade. Lyttelton also exports wool and wheat.

South Island leads in meat and wool production, but North Island takes first place for **dairy farming**. The wetter climate of North Island produces more suitable pasture. Most of the dairy farms are in the rich plains of Auckland, Taranaki and Wellington. Large quantities of butter and cheese are exported. This trade

has assisted the growth of the ports Auckland, Wellington, and Napier. In South Island Otago is the chief dairy-farming province. Dunedin and Port Chalmers, on Otago Harbour, are the outlets for the produce of this region.

Fruit-growing has received the attention of many colonists during recent years. There are fruit-farms in both islands. Apples and pears are the chief fruits grown; but Auckland is the centre of a fruit-farming area that produces oranges, lemons, grapes and other sub-tropical fruits.

New Zealand has the distinction of possessing the longest tunnel in the British Empire. This is the Otira tunnel, opened in 1923. It pierces the Southern Alps at Arthur's Pass for nearly $5\frac{1}{2}$ miles. The railway laid through the tunnel links the east coast town Christchurch, with the western ports, Greymouth and Hokitika.

EXERCISES

1. Describe the surface relief of New Zealand, and explain the effect of the mountains on the distribution of rainfall.

2. Make sketch maps showing the situation of Wellington, Christchurch and Lyttelton, and Auckland. Write brief notes in connection with each.

3. Give a list of the chief exports of New Zealand, saying from which port they are sent out.

XXVII. EUROPE—PART I

I. SURFACE RELIEF AND RIVERS

Europe has two highland regions and one lowland region. These regions are (1) the **Scandinavian plateau** in the north; (2) the **Great Plain**, which lies between the highland regions; (3) a complicated system of **fold mountains and plateaux** in the centre and south.

The **Scandinavian Plateau** is composed of very hard ancient rocks. Rocks of the same kind are found in the highlands of Scotland and the north-west of Ireland. These three areas must once have been a single large plateau.

The most striking feature of the Scandinavian plateau is the broken edge which faces the Atlantic. It is fringed with thousands

of islands, and penetrated by numberless **fiords**. The fiords wind in among the mountains, sending out branches on each side. Some of them are 80 miles long. At the head of each fiord there are torrents rushing through wild gorges, or cascading over rocky ledges. Fiords are deep valleys which have been flooded by the sea. (Refer to Fig. 127.)

The highest part of the plateau is in the south, where its altitude reaches 8000 feet. This portion is covered with snowfields, from

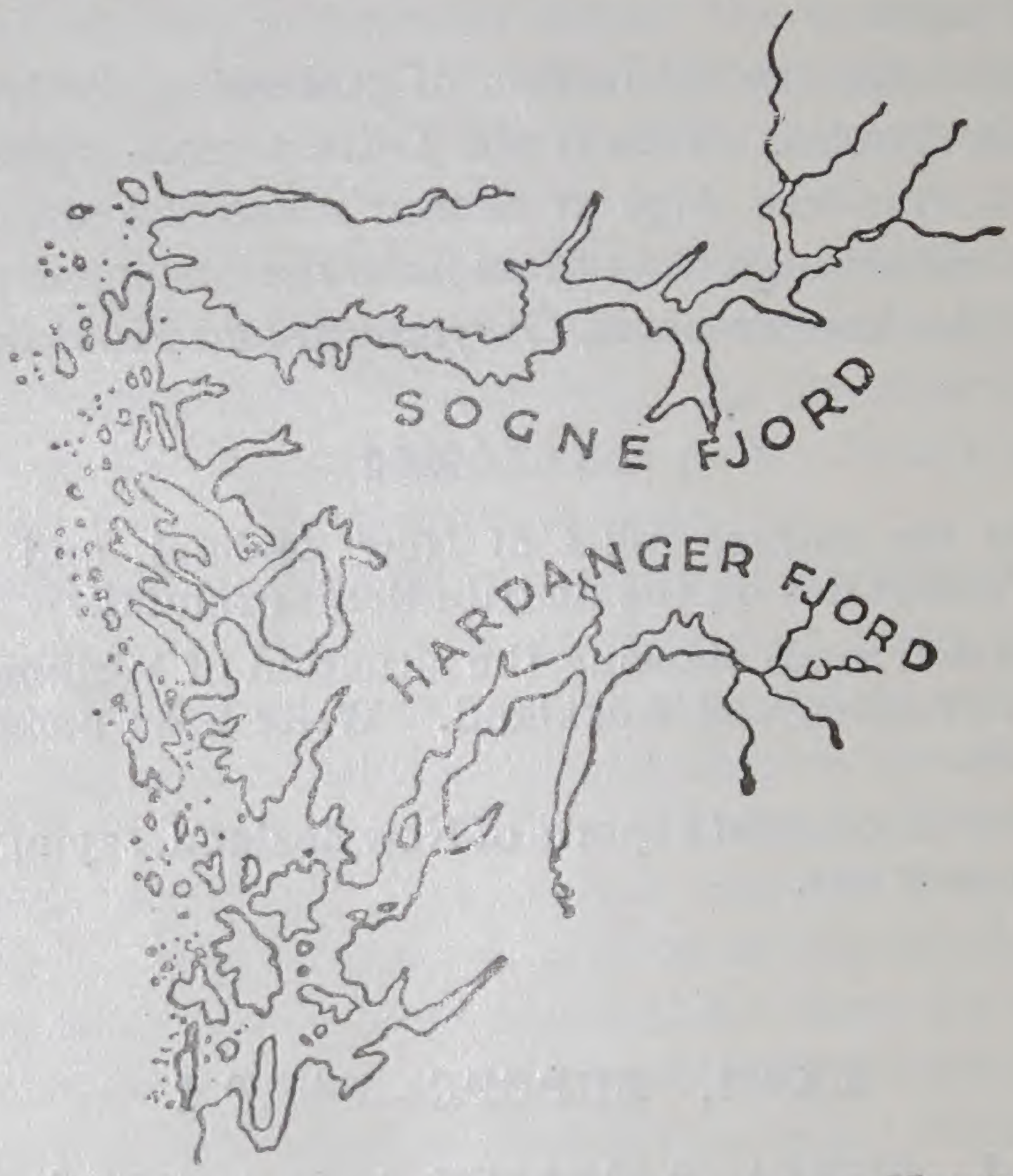


FIG. 121.—A PORTION OF THE COAST OF NORWAY.
Showing Sogne Fiord and Hardanger Fiord, and some of the islands that lie off the coast.

which many glaciers glide down into the valleys. The long slop of the plateau is the Swedish side. Hence the rivers of Swede are comparatively long, and they form chains of lakes. The Nor wegian rivers are short and swift. Both countries have valuabl sources of power in waterfalls. This is utilised in the timber an chemical industries.

The Great Plain of Europe. The largest plain in the world i that which lies between the Arctic Ocean and the central highland

of Eurasia. It extends through 160 degrees of longitude, though it becomes rather narrow in eastern Siberia. Near meridian 60° E. the surface rises to the Ural Mountains. These have an average height of two to three thousand feet, though the highest point is over 5000 feet. The Urals are not a political frontier. They are a convenient landmark between the Asiatic and European portions of the great plain.

Northern France, Belgium, Holland, Germany, Poland and Russia are parts of the European plain. The plain of England was

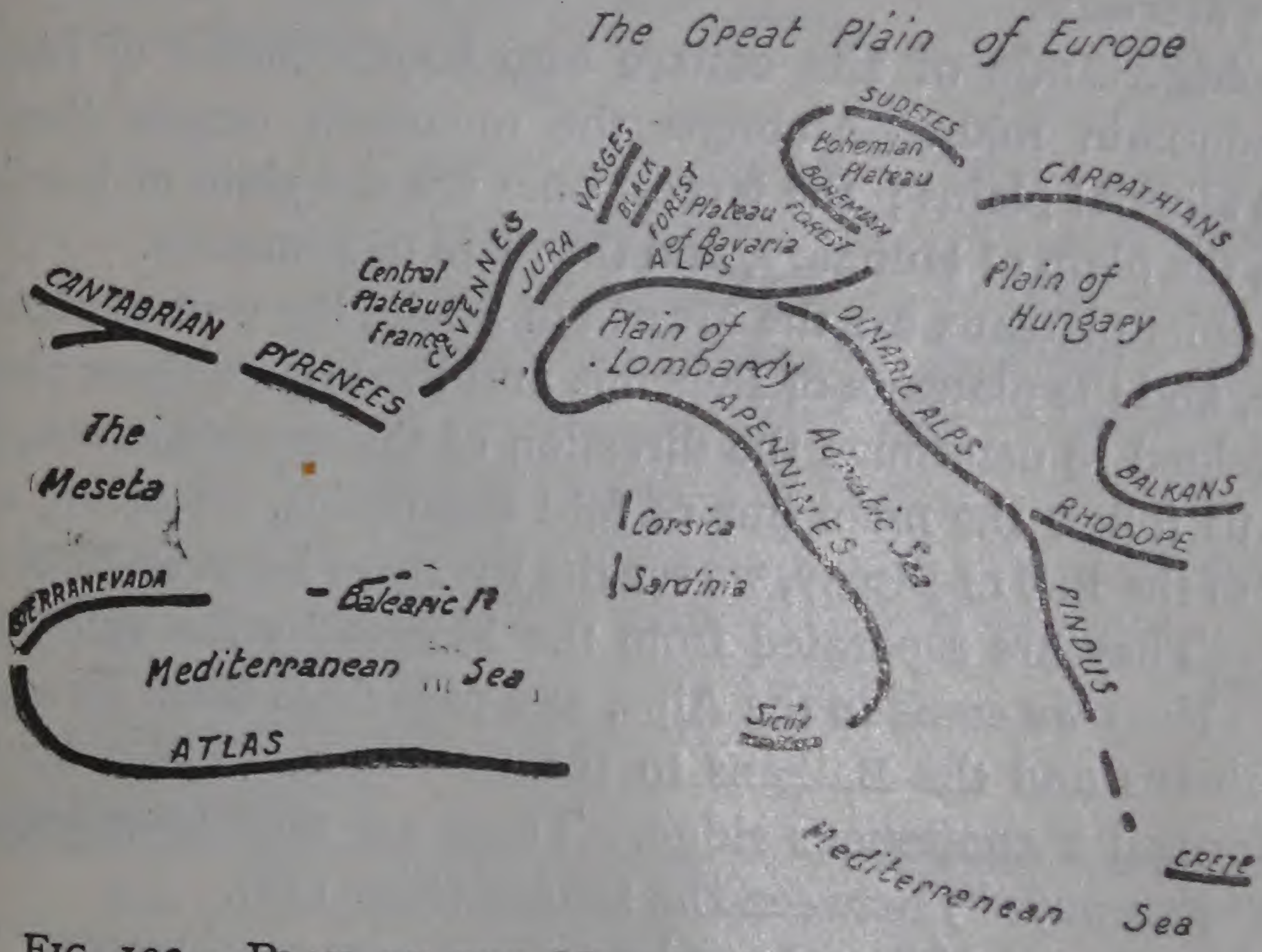


FIG. 122.—PLAN OF THE MOUNTAIN SYSTEMS OF EUROPE.

once connected with it. Submergence of a low-lying portion formed the North Sea. This submerged area is the continental shelf of Europe. The British Isles rise from the continental shelf.

The surface of the European plain is rather uneven; but only in the Valdai Hills of Russia does the land rise to 1000 feet. During the Great Ice Age most of the region was covered with ice. The soil consists largely of glacial deposits, and is generally very fertile. Hundreds of small lakes in the east of Germany occupy hollows in the surface of the glacial deposits. The larger lakes of Finland and Russia are the results of ice action.

Many rivers flow through the European plain. Those which enter the Arctic Ocean are of little value. The Volga, the longest

river of Europe, rises in the Valdai Hills. It wanders slowly through Russia to the Caspian Sea. This river is a useful waterway, but its value would be much greater if it flowed into a sea connected with the ocean. The Elbe of Germany flows from the central highlands to the North Sea. Though much smaller than the Volga, it is a more important river for trading purposes. The Rhine is more important still; it forms a waterway from the North Sea, through Holland and Germany to Bâle in Switzerland. The Seine and the Loire, which flow across the French portion of the plain, are also useful waterways.

The highlands of the centre and south consist of plateaux and mountain folds. Amongst the mountain ranges there are several alluvial plains; the largest ones are the plain of Lombardy (Italy), the plain of Hungary, and the plain of Rumania.

The chief plateaux are the Meseta of Spain, the central plateau of France, and the plateaux of Bohemia and Bavaria. These plateaux have helped to determine the direction of the mountain ranges.

Let us follow the main line of fold mountains. Starting on the shores of the Bay of Biscay, we see the Pyrenees between France and Spain. They are separated from the Meseta by the valley of the Ebro. Next we come to the Alps, and pass from them through the Carpathians and the Balkans to the Caucasus. These may once have formed a continuous ridge. There are now some important gaps ("gateways") between the ranges (Fig. 128).

From each end of the Alps a long ridge runs southwards. These form the peninsulas of Greece and Italy, separated by the Adriatic Sea. The eastern ridge is known as the Dinaric Alps in the north, and as the Pindus Range in Greece. The western ridge, the Apennines, runs through the whole of Italy. But it can be traced much farther. After a break at the Strait of Messina it is seen in Sicily. It reappears as the Atlas of Africa. Then after a break at the Strait of Gibraltar it is seen in the Sierra Nevada of Spain and this can be traced to the Balearic Isles.

North of the main line of fold mountains there are some older worn-down mountains. The chief of these are the Vosges and the Black Forest, between which flows the river Rhine.

The Alps are the most important mountains in Europe. They consist of a number of ridges. From the Gulf of Genoa they run

north, on the borders of France and Italy, to Mont Blanc. This is the loftiest peak in Europe—15,732 feet high. Then the Alps bend towards the east, sending their high ridges through Switzerland and Italy into Austria.

Large snowfields cover the higher parts. From these over a thousand glaciers glide slowly down the valleys. Two important rivers, the Rhine and the Rhone, have their source in a glacier on Mt. St. Gothard.

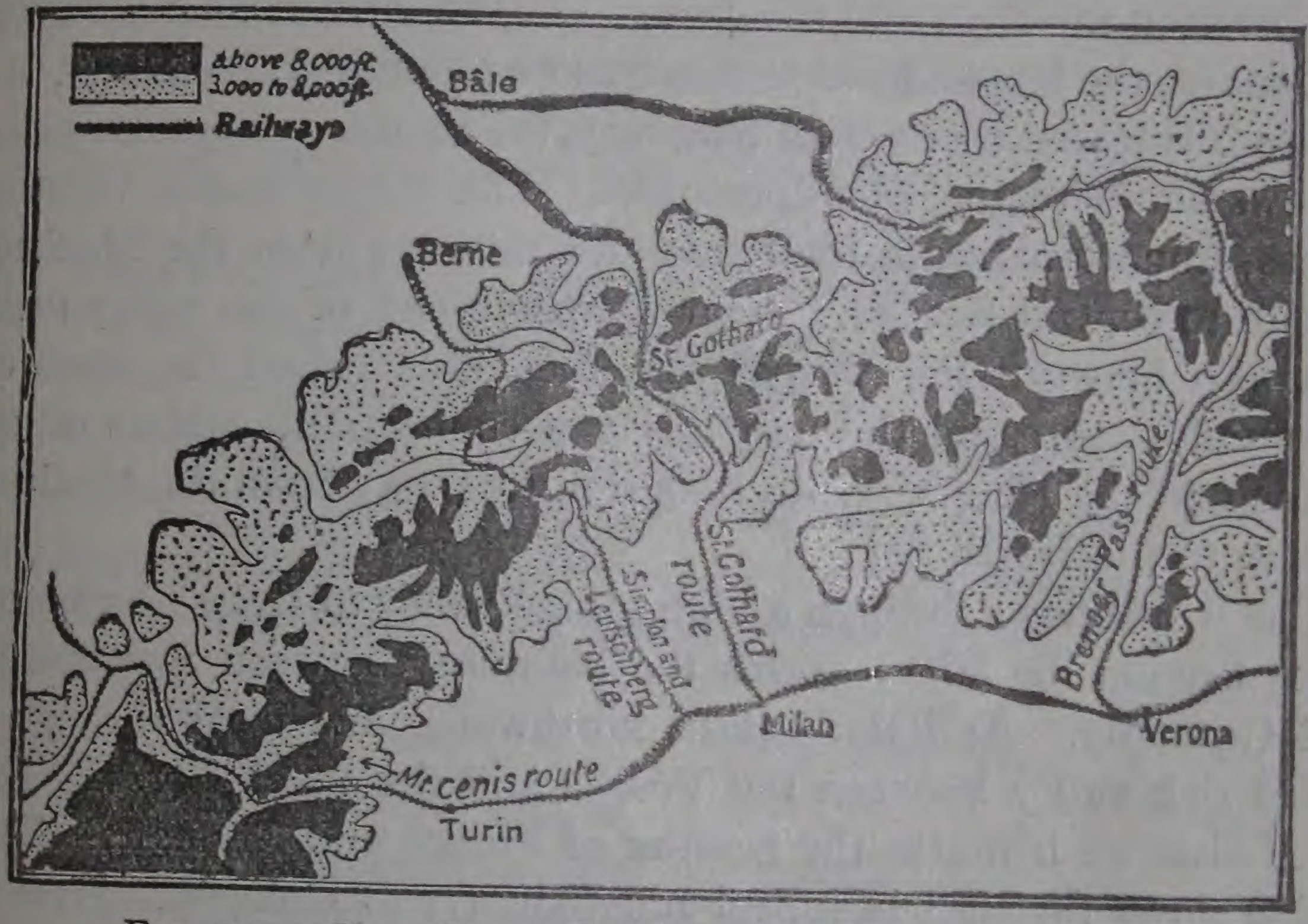


FIG. 123.—THE CHIEF ROUTES INTO ITALY THROUGH THE ALPS.

The Alpine region is famous for its fine scenery. It is visited by thousands of tourists during the summer months. The beauty of the landscape is partly due to lakes. On the Swiss side of the mountains there are Geneva, Lucerne, Zurich, and many smaller lakes, and the large German lake Constance. Maggiore, Como and Garda occupy valleys on the Italian side.

Good mountain roads have been constructed over alpine passes. These are open during the summer months. Railways are carried through the mountains by the Mont Cenis, Simplon, St. Gothard and other tunnels. Thus there are good means of communication between opposite sides of the Alps. The Pyrenees are a more serious obstacle; railways between France and Spain are carried

round the ends of the range, but a tunnel near Pic du Midi was opened in 1928.

The chief rivers amongst the highlands are the Po, Rhone, Rhine and Danube. The Po has built up the rich plain of Lombardy, in northern Italy, with sediment washed down from the Alps and Apennines. It is continually pushing its delta farther into the Adriatic Sea.

The Rhone flows through a high valley to Lake Geneva, which lies between the Alps and the Juras. Leaving the lake at the town of Geneva, the Rhone flows through more mountainous country. At Lyons it is joined by its chief tributary, the Saone. From this point it flows south to the Mediterranean. The Rhone-Saone valley is a most important route for roads and railways from the Mediterranean to central Europe. Near the north end of the valley there is a gap between the Vosges and the Juras called the Gate of Burgundy. A canal through this gap connects the waters of the Rhine and the Rhone. This makes a waterway from the Mediterranean to the North Sea.

The Rhine flows through a high alpine valley to Lake Constance. After leaving the lake it forms the boundary between Switzerland and Germany. At Bâle it turns northwards and flows through a broad rich valley between the Vosges and the Black Forest. For some distance it marks the frontier of France and Germany. The Rhine flows through beautiful hilly country to Cologne. Here it reaches a busy industrial region, and it is greatly used for transport purposes. Then it crosses the frontier, and reaches the North Sea by several mouths. On one branch stands the great Dutch port, Rotterdam.

The large river Danube is of special value because it flows through several countries—Germany, Austria, Hungary, Yugo-Slavia, Rumania. Part of its lower course is the boundary between Rumania and Bulgaria. Rising in the Black Forest, the Danube flows through southern Germany. It passes through the Austrian Gate, between Bohemia and the Austrian Alps, and reaches Vienna, the capital of Austria. The river continues its eastward course and then turns south near Budapest, the capital of Hungary. After flowing through the plain of Hungary, it turns somewhat towards the east through Yugo-Slavia, passes Belgrade, the capital, and

reaches the Iron Gate. This is a gap between the Balkans and the Transylvanian Alps. After a long run through the plain of Rumania it enters the Black Sea by a swampy delta.

II. CLIMATE AND VEGETATION

Europe may be divided into four climatic regions. These are (1) **The Mediterranean region**, (2) **North-west Europe**, (3) **Continental Europe**, (4) **Arctic Europe.**

FIG. 124.—THE REGIONS OF EUROPE.
The broken lines mark roughly the boundaries of the regions. The numbers under the names of towns are the mean temperatures for the coldest and warmest months.

The Mediterranean region as a whole includes portions of Europe, Africa, and Asia bordering the Mediterranean Sea. Climate varies a little in different areas, but generally speaking similar conditions prevail throughout the region.

The **Mediterranean region of Europe** consists of three peninsulas, the south of France, and a large number of islands. These lie

between 35° and 45° N. The climate is therefore sub-tropical. Summers are hot and dry, and characterised by brilliant sunshine. Winters are very mild and rainy; but there are few places with heavy rainfall. The annual rainfall is 32 inches at Gibraltar, 21 at Marseilles, 32 at Rome, and 15 at Athens. The monthly temperatures at several towns are inserted in the diagram. The climate of elevated portions of the peninsulas is not quite Mediterranean in character; the annual range of temperature is rather greater.

North-west Europe includes the British Isles, and the shorelands of the continent from North Cape (Norway) to the Bay of Biscay. It will be noticed that part of this region is within the Arctic Circle. The North Atlantic Drift carries warm waters into the seas of North-west Europe. This reduces the cold of winter. The climate is equable. Summers are cool, winters are very mild. Most places have an annual range of temperature of between 20° and 30°. Figures are given in the diagram.

North-west Europe lies in the belt of the westerly winds. It therefore receives rain at all seasons, but most falls during the winter months. The annual rainfall varies greatly—from 20 to over 100 inches. The wettest places are the mountain areas of Britain, where the amount is about 100 inches. Edinburgh has 25 inches, Paris 21, and Bergen in Norway has 73 inches per year.

Continental Europe is the broad part of the continent between the Mediterranean region and the land which borders the Arctic Ocean. Its climate is extreme. Summers are warm, winters are cold. Refer to the diagram for temperature figures. The range in temperature increases towards the east (see page 32), and, generally speaking, rainfall *diminishes* towards the east and south-east. Berlin has 23 inches, Moscow 21, and Astrakhan 6 inches of rainfall per year.

Arctic Europe is a small region bordering the Arctic Ocean. Winters are long and very cold, summers are short and warm. At Archangel the mean monthly temperature ranges from 7° to 60°. The port is closed by ice for six months.

Natural Vegetation is now found in few parts of Europe, except the mountains and the northern areas. Most of the land was cleared long ago for agricuiture. The Mediterranean is a region

of evergreen trees and shrubs, fitted to withstand the summer drought. Many of the plants have stiff leathery leaves, or leaves coated with resin or hairs. These help to prevent loss of moisture by evaporation. The chief trees and shrubs are the olive, holm-

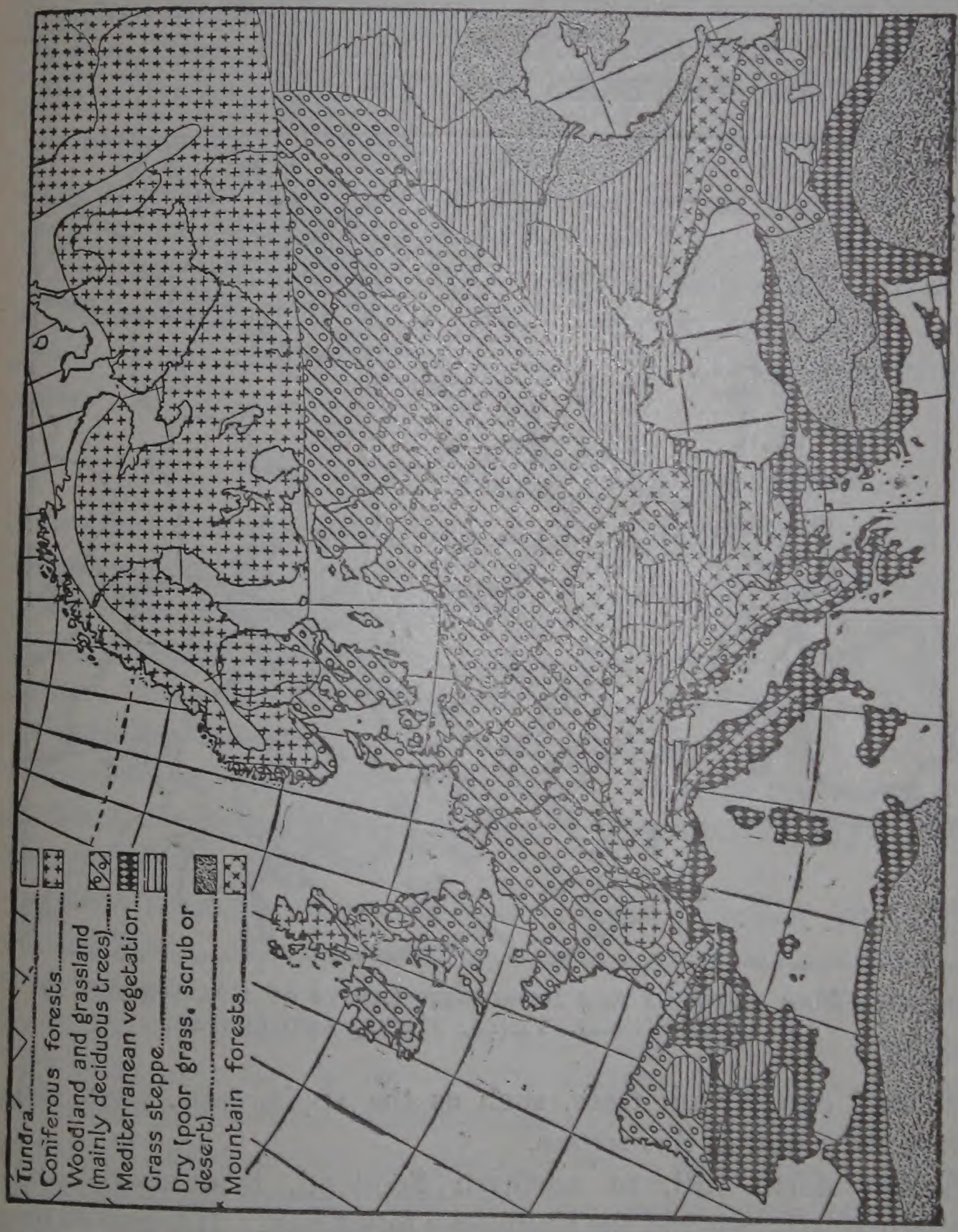


FIG. 125.—NATURAL VEGETATION OF EUROPE.

oak and myrtle. The olive tree grows in the lowlands; it cannot endure cold winters. Warm dry summers are excellent for ripening fruit, and the Mediterranean region is one of the chief fruit-growing regions in the world. The chief fruits are the orange, lemon, grape,

fig, peach, apricot, mulberry, and pomegranate. The mountain forests of the Mediterranean region are like those of central and northern Europe. There are chestnut woods in the Apennines, and forests of beech and pines on the Apennines, Alps and Pyrenees.

Going northwards from the Mediterranean region we pass into the deciduous forest belt. This includes all the central part of Europe and most of the British Isles. The chief trees are the oak,

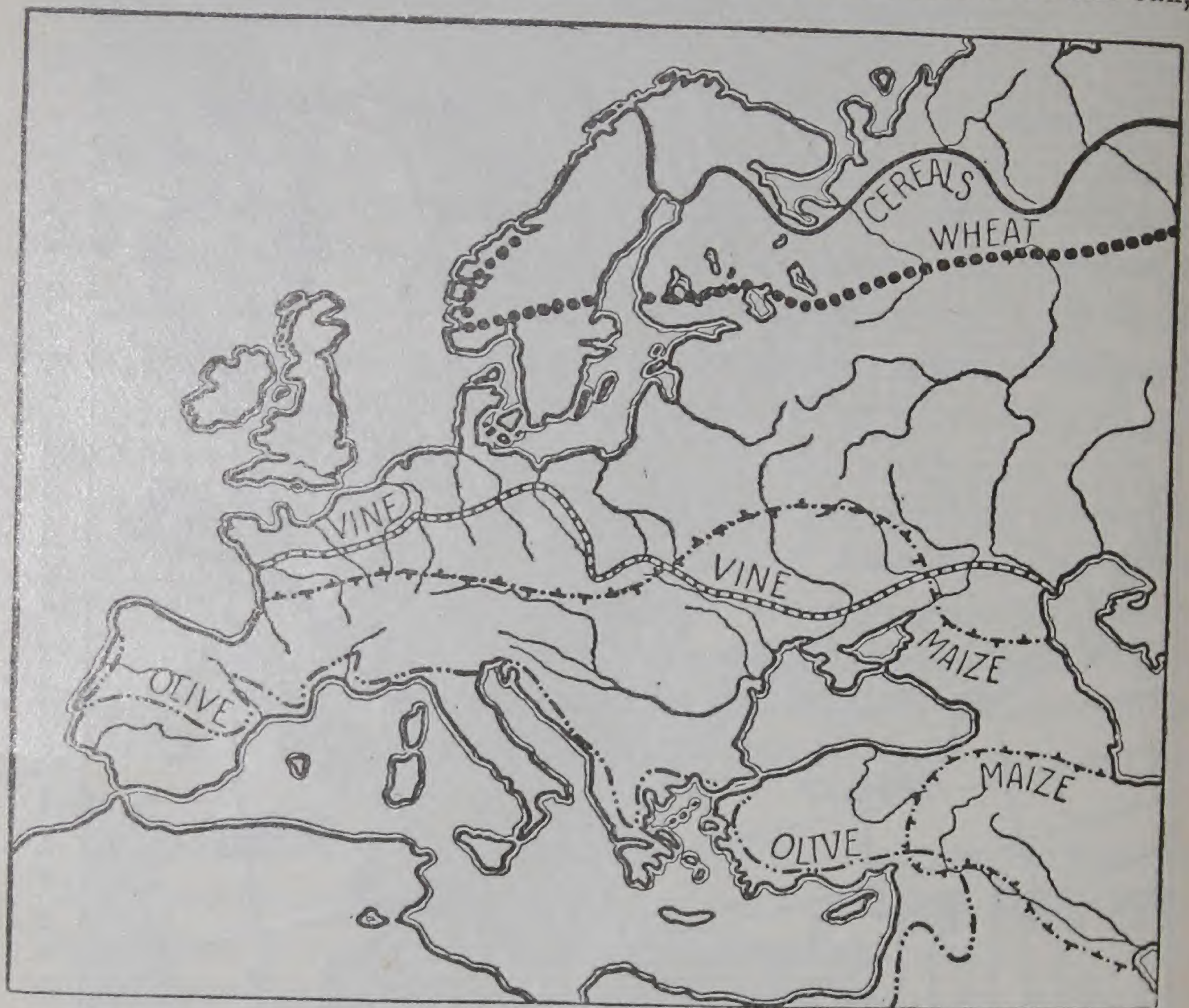


FIG. 126.—MAP SHOWING THE NORTHERN LIMITS OF CULTIVATION OF CEREALS, WHEAT, VINES, MAIZE, AND OLIVES.

beech and elm. Fruit trees, such as the apple, pear, plum and cherry, grow well in this region.

Farther north still, in northern Scotland, Scandinavia and northern Russia, we find the **coniferous forest** belt. It is part of the great forest that stretches across northern Europe and Siberia. The trees—pines, firs, larches—have needle-shaped leaves. This type of vegetation is also found on the higher parts of the Alps, Carpathians and other mountains in central and southern Europe.

Beyond the coniferous forest lie the treeless prams called **tundras**. This region borders the Arctic Ocean. It is continued eastwards through the whole of northern Siberia. Plants are mainly grasses, mosses, lichens, and low berry-bearing bushes. Similar vegetation spreads over the high part of the Scandinavian plateau, and it is found above the coniferous forests on the mountains farther south.

The dry climate of south-east Russia is very unsuitable for trees, but the rainfall is sufficient for grass in most places. This is therefore a **steppe** region. The steppes extend beyond the Urals and the Caspian Sea, far into the interior of Asia. Detached areas of steppe are found in Hungary and Rumania.

Europe is almost without **desert**, but there is a small tract in the neighbourhood of the Caspian Sea. It is surrounded by a belt which is intermediate between steppe and desert, described as **scrub**.

III. THE PEOPLE OF EUROPE

Europe is a continent of many nations speaking different languages. Nearly all Europeans belong to the **white race**. Their ancestors probably came from south-west Asia. They wandered into Europe at the time when other white people were settling in the north of India. That was several thousand years ago.

Civilisation started in the Mediterranean region. The first civilised states were Greece and Rome. Some of the well-known Mediterranean cities—Athens, Rome, Constantinople, Marseilles—were founded in early times.

Athens was built on a small plain in Greece, around a hill called the Acropolis. On the summit of the hill was a beautiful temple, the Parthenon, now in ruins. Athens became a centre of learning. Its people were greatly interested in science, literature and sculpture. They were also traders like all the ancient Greeks, and it was Greek traders who founded **Marseilles**, at the focus of several trade-routes. These routes are the Garonne valley, the Rhone valley, the sea routes to the east and south, and the coastal routes to Italy and Spain. All the routes are as important to-day as they were in ancient times.

Rome came into existence as a trading town at a ford across the river Tiber. When the Romans had conquered a large part of

Europe, northern Africa and south-west Asia, Rome was capital of the western world. The Romans were great road makers. They built good roads from the capital to all parts of their empire. They also taught conquered peoples the arts of civilisation. A Roman emperor, Constantine, founded **Constantinople.** The city is built on the shores of the Golden Horn, which is an arm of the Bosporus. Constantinople was well placed for communication with those parts of the empire round the east end of the Mediterranean, and it commanded the route to the Black Sea.

Raids by **yellow (Mongolian)** tribes were partly the cause of the break-up of the Roman empire. Some of these invaders settled in Europe. Their descendants are the people of Hungary (Magyars), the Bulgars and Turks of the Balkan peninsula, and some Tartar people in the Ural region. The Lapps and Finns of northern Europe are descended from tribes that came from Asia in early times.

The Roman empire began to break up in the fifth century. During the following four or five centuries the nations of Europe were gradually forming. Natural features influenced the distribution of people and the creation of states. Many changes of boundary have been made from time to time as the result of wars and treaties; but the influence of natural features can still be traced. The Pyrenees separate the Spaniards from the French; the Alps form a frontier region for France, Italy and Switzerland. Mountain ridges divide the Balkan Peninsula into regions, each of which was formerly occupied by separate peoples, while the mountain areas were held by independent tribes.

Europe has a long history as a continent of civilised peoples. This is explained partly by climatic influences and the shape and build of the continent. Europe contrasts in every respect with Africa. Except in the north of Russia, climate is never cold enough to interfere seriously with man's work. No part of the continent has a climate hot enough to discourage work. The narrow seas have always encouraged navigation, travel and trading. Thus different peoples have continually been brought into contact with each other, and civilisation spread over the continent.

Love of the sea, and the desire to see and trade with other peoples, led Europeans across the oceans. They discovered the Americas,

FIG. 127.—A NORWEGIAN FIORD.

Australia and other lands. These lands were peopled mainly from Europe. Thus European civilisation has spread far beyond the boundaries of the continent.

Europe has a smaller area than any other continent except Australia. Its area is a little greater than that of Brazil, but its population is fifteen times as great. Scandinavia, northern Russia and the Scottish highlands have a sparse population. The most **densely peopled areas** are England, the middle of Scotland, northern Italy and the southern part of the Great Plain. The last includes northern France, Belgium, Holland, southern Germany and part of Russia. These are the chief **industrial regions.** The agricultural lands are generally less densely peopled. The industrial regions are those which possess mineral wealth, especially coal. Thus it may be said that density of population in Europe depends upon the distribution of minerals. In Asia density of population is controlled by the **food-producing power of the soil.**

EXERCISES

1. Draw a plan of the mountain ranges and plateaux of Central and Southern Europe. Insert and name the larger rivers. Write short notes describing the direction of the main water-parting of Europe.

2. Refer to your atlas maps, and give the names of European countries which have mountain ranges or rivers as boundaries. Which is the better kind of frontier, mountain range or river? Give reasons for your answer.

3. What zones of vegetation would be passed through on a journey from Archangel, on the White Sea, to Astrakhan, in the delta of the Volga?

XXVIII. EUROPE—PART II

I. MEDITERRANEAN LANDS

1. **The Balkan Peninsula**, south of the Danube and the Drave, includes the kingdoms of Albania, Greece and Bulgaria and the republic of Jugo-Slavia. Nearly all the workers in these states are engaged in **primary production**—pastoral work and forestry on the mountains, agriculture in the valleys.

Albania is a very mountainous country, with no railways, and very few schools. The people are engaged mainly in rearing cattle and sheep. Food crops are raised in the valleys.

Jugo-Slavia is also mountainous, except in the north. Alpine ridges run parallel to the coast, obstructing communication between the narrow coastal plain and the interior. But the mountain forests of oak, beech and fir yield valuable timber, and a number of people are engaged in timber industries. There are low fertile tracts of land beside the Danube, and in the valleys of the Save and Morava. In summer these are almost covered with wheat and maize. On the mountain slopes there are vineyards and orchards of fruit trees, especially plums. Higher up there is pasture land, where people rear sheep, swine, cattle and goats. The coastal plain (Dalmatia) has the typical evergreen vegetation of this region, and plantations of oranges, olives, figs and other fruit trees. Belgrade, the capital, is the chief commercial centre. The city commands water transport on the Danube and the Save. It is also on the mid-European railway route, known as the Orient Express, which is led through the mountains by the Morava valley (Fig. 129).

Bulgaria is a country of small landowners. Two-thirds of the people are engaged in agriculture—using primitive methods. The Balkans, which run through the middle of the country, have fine forests of beech and oak. There is a lowland region on each side of the mountains, one in the basin of the Danube and the other in the basin of the Maritza. In the northern area the chief crops are barley, rye and potatoes. The southern area has greater variety. It is rich with fields of wheat and maize, vineyards, orchards of plums and peaches, and plantations of tobacco and cotton. A special activity of the people in this area is the cultivation of roses. The flowers are used for the manufacture of attar of roses, at Philippopolis. **Sofia**, the capital, seems rather isolated, but the city is at the focus of **four valley routes**, and it is on the Orient Express line.

Three-quarters of **Greece** is mountain, lake, or marsh. The people are now giving attention to tree-growing, with a view to restoring the forests which once clothed the mountains. Seafaring and agriculture are the chief occupations, but recently dairy farming has developed considerably. The plains and valleys have a climate

well suited to fruit-growing. The chief crop is **currants** (dried grapes), exported from Patras. There are tobacco and cotton plantations near the east coast, and wheat, barley and maize are grown in the lowlands round the Gulf of Salonika. **Athens**, the capital, has lost its ancient importance. The city is connected by rail with its port, Piraeus. **Salonika**, port for the northern part of Greece, is the terminus of a railway which goes up the Vardar valley, and joins the Orient Express line at Nish.

Constantinople and a small area behind the city are all that remain of Turkish territory in Europe. Here a ferry service links the Orient Express with the Anatolian railways and the route to Baghdad.

2. **Italy. Northern Italy** consists of the Plain of Lombardy, drained by the river Po. Tributaries of this river have cut valleys far back into the Alps and the Apennines. The sediment so removed has gone to build the plain, and to form a delta in the Adriatic. **Southern Italy** includes the Apennine peninsula and the island of Sicily. Innumerable streams flow down the sides of the Apennines; the only important ones are the Tiber, on which stands Rome, and the Arno, on which are Florence and Pisa. The two portions of Italy differ in many respects.

The people of Southern Italy are mainly engaged in **agriculture** and **fruit-growing.** The corn crops include wheat and maize. Maize, and flour made from chestnuts, are greatly used as food by the peasants. Grapes are used for making wine in both South Italy and Sicily; much is exported. Florence, far up the valley of the Arno, surrounded by Apennine hills, is in a region of olive groves and vineyards. Olive oil, dried fruits, and wine, from the Arno valley, are exported from Leghorn.

Sicily has a particularly large trade in oranges and lemons, exported through Palermo. Etna is a volcano, and the adjoining area is the chief European source of sulphur, exported from Catania.

Northern Italy is a densely peopled region. Towns are numerous and occupations are very varied. The country people are largely engaged in **agriculture**, **dairy-farming** and the rearing of **silk-worms** and **poultry.** The corn crops include wheat and maize, but rice is also cultivated on low-lying land near the rivers. Every farmer grows grapes and mulberries. Many farms specialise in

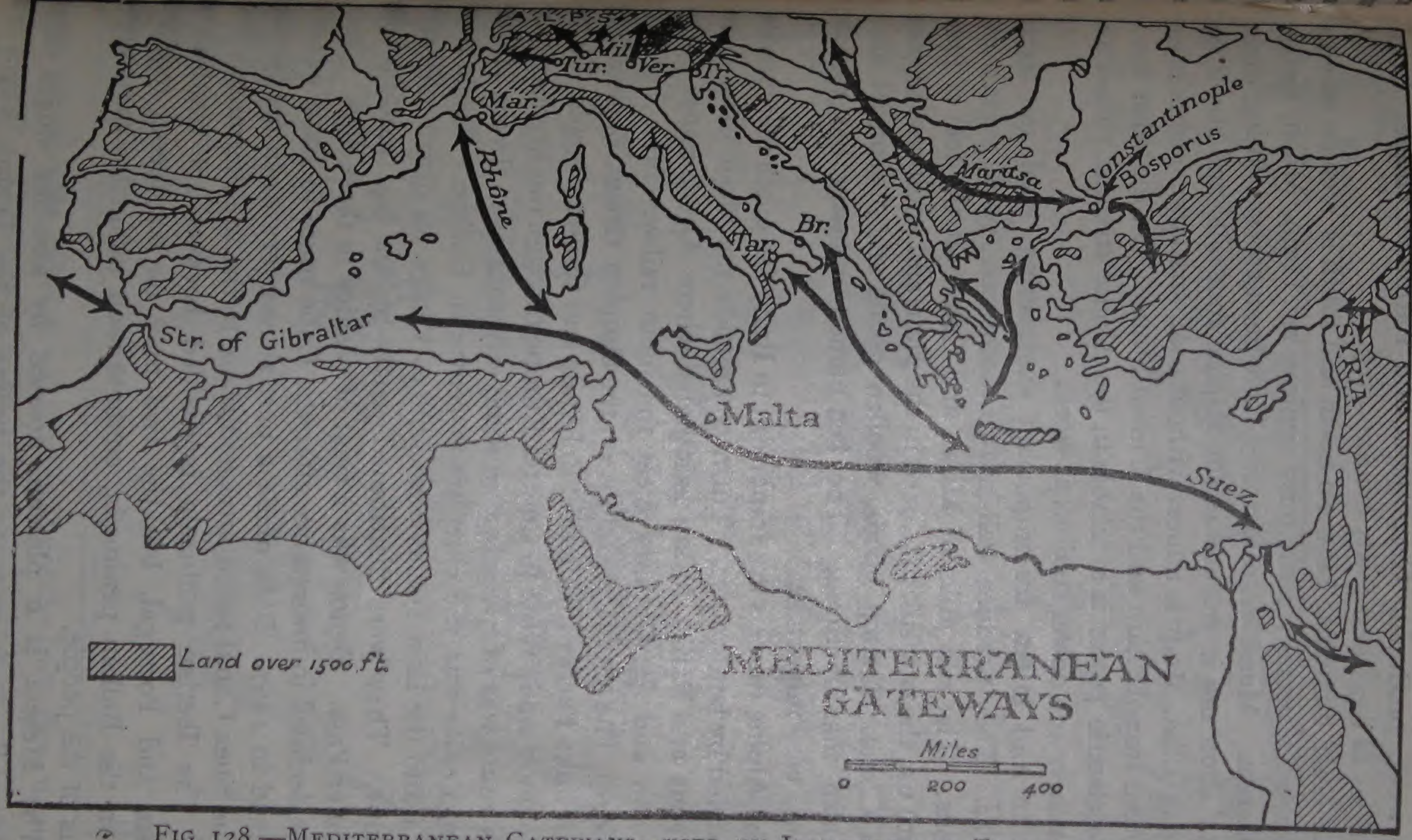


FIG. 128.—MEDITERRANEAN GATEWAYS—USED BY INVADERS AND TRADERS IN ALL AGES.
Br. = Brindisi, *Tar.* = Taranto, *Tr.* = Trieste, *Ver.* = Verona. *Mil.* = Milan, *Tur.* = Turin, *Mar.* = Marseilles.

dairy work, producing Gorgonzola and Parmesan **cheese.** Large quantities of eggs and fowls are exported.

The **chief difference between north and south** is seen on entering the towns, especially such busy centres as Turin, Milan, Brescia and Genoa. Many large factories have been erected during recent years. **Iron ore** is worked in the Alpine foot-hills and also in the island of Elba. Italy is almost without coal, and large quantities are imported from Britain and the United States. On the other hand, **hydro-electric power** is available in the Alpine streams. There are now nearly 400 power stations at work.

Turin and **Milan** are important **engineering, steel** and **textile** centres. They produce well-known motor-cars, tyres, engines and wagons. The silk mills of Milan and Como (at the foot of Lake Como) use the raw silk produced in the plain and additional supplies from China. Cotton goods, woollen goods and "artificial silk" are also manufactured. The last-named industry has recently become very important.

The Alpine tunnels are important to Italy, for much merchandise is carried by land routes. Turin commands the Mont Cenis route to Lyons and Paris. Milan is situated where Alpine routes by the Simplon and St. Gothard meet the main railway from Turin to Venice. The city is therefore on the **Simplon Orient Express** line, which links Paris with Venice, Belgrade and Constantinople. Venice has a good trade route to Central Europe through the Brenner Pass. This route was of special value some centuries ago. In the Middle Ages, Venice was the chief trade centre in Europe. Goods from India and the East Indies were sent to Venice for distribution over Europe. They were distributed partly by sea and partly by the Brenner Pass. Genoa was a rival of Venice in those days. Both cities declined in importance after the Cape route to India was discovered in 1497. Both made a partial recovery when the opening of the Suez Canal again attracted trade to the Mediterranean.

3. **The Iberian peninsula** is divided between the republics of Spain and Portugal, but the two may be considered together. As in the Balkan **peninsula, configuration** influences the occupations of the people.

The Meseta is a **plateau,** crossed by saw-like ridges called "**sierras,**" which separate the basins of the Douro, Tagus and

Guadiana. This high region has not the typical Mediterranean climate. Rainfall is deficient almost everywhere on the plateau.

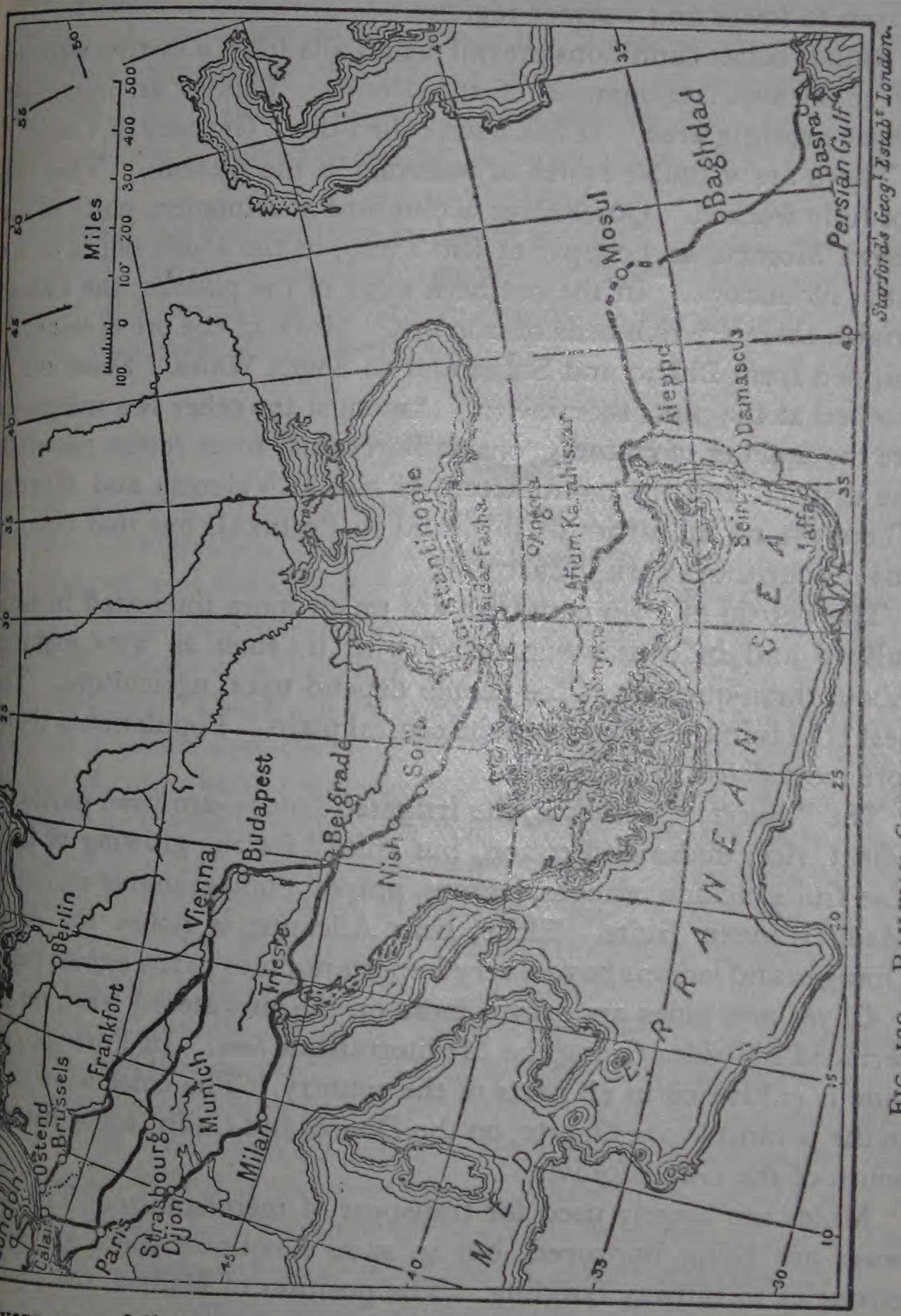


FIG. 129.—RAILWAY CONNEXIONS BETWEEN LONDON AND BAGHDAD.

Rivers are of little value for irrigation, because they flow in deep rocky valleys. Consequently the Meseta provides little except poor pasture land. **Pastoral work** is therefore a general occupation **on**

the plateau. Sheep and goats are reared in large numbers. Spain has long been noted for fine merino wool. In winter the flocks are driven to lower and warmer regions.

Rather better conditions prevail near Valladolid, a district watered by some small tributaries of the Douro. This is an important wheat-growing area. It has been called the "Granary of Castile."

There are valuable stores of minerals in the plateau. They are not fully worked. Quicksilver is obtained at Almaden, north of the Sierra Morena, and copper at Rio Tinto, in the south slopes of the same mountains. In the northern edge of the plateau, the Cantabrians, there are rich beds of iron ore. Much of the ore obtained is shipped from Bilbao and Santander to South Wales. Some ore is smelted at the ports themselves. Amongst the other few industries are the making of cotton goods at Barcelona, from cotton grown in the district, and the manufacture of silk at Valencia and Murcia. There are no industries of this kind in Portugal, but that country has a flourishing cork industry.

The people of both countries are much more interested in agriculture and industries connected with it, such as wine-making. About three-quarters of the people depend upon agriculture. The best land is in the valleys and the coastal plain. Population is therefore most dense in these areas.

The "huertas"—that is, the irrigated lands—are used partly for wheat, rice, maize and cotton, but chiefly for the growing of fruit. The fruits include oranges, lemons, grapes, pomegranates and other Mediterranean fruits. Elche, near Alicante, is noted for dates. Oranges and lemons have a very important place in the export trade.

Olives and vines are grown more on the unwatered land, on the terraced hill-sides facing the Mediterranean Sea. In Portugal, the vine is cultivated in all parts of the country. The chief wine ports in the peninsula are Oporto, on the Douro, and Cadiz, some distance south of the Guadalquivir.

Mules are largely used for transport of merchandise. The railways are being improved, but in such a country there are great obstacles to railway building. The position of **Madrid**, the capital of Spain, has one advantage—it is almost equidistant from all the chief towns in the peninsula. It is connnected with them by rail. Lines radiate from the capital, through convenient gaps in the

sierras, and follow river valleys to the coast. One of these railways connects Madrid with the Portuguese capital, **Lisbon**, which is a large seaport. The Pyrenees are an obstacle to communication with France. Franco-Spanish lines cross the border at the ends of the mountain range, quite close to the coast. A railway, constructed for fruit traffic, runs from the Ebro valley to Pau (France). It passes through the Pyrenees by a series of tunnels, opened in 1928.

Gibraltar is a fortress on a rocky promontory. It commands the strait which leads to the Mediterranean. The rock and town have been in the possession of England since 1704. Gibraltar is important as a naval station and coaling port.

II. THE WESTERN END OF THE GREAT PLAIN

The western portion of the Great Plain of Europe is divided between six countries. These are the republics of France, Germany and Poland, and the kingdoms of Belgium, Holland and Denmark. But it will be observed that the central highlands of Europe extend into both France and Germany.

1. France. There are two masses of high land in France, the Central Plateau and the Western Alps. The Central Plateau is separated from the Pyrenees by the Gate of Carcassonne, and from the Alps by the long trench-like valley of the Rhone-Saone. Both of these valleys are useful routes for passenger and goods traffic. At its northern end the Central Plateau is connected with the Vosges, which overlook the Rhine valley, and with the low Ardennes plateau, which lies partly in France and partly in Belgium.

There are several industrial regions in France, but **agriculture** engages half the working population. Most of the farmers and gardeners own the land they work. They cultivate their plots with the help of their families. Hence their methods are rather old-fashioned. **Wheat** is the chief crop. Wheat fields may be seen in all parts of the plain, but they are especially numerous in the middle of the Loire basin, which is called the "Granary of France."

Other crops include maize, grown in the Garonne basin, barley, hops, and beet raised in the north. The northern part of the plain has a large number of **market gardens.** This is due to the demand

for vegetables and flowers in Paris and other towns. There is also a good market for such produce in England. Fruit, flowers and vegetables are exported from the Channel ports, Havre, Dieppe and St. Malo.

More important than anything mentioned in the last paragraph is **the vine**; in point of value it comes second to wheat. Four million acres of land are devoted to the vine. A large number of people are engaged in the **wine** industry. The chief vine-growing and wine-making areas are the four great river basins. These are the Garonne, the Rhone-Saone, the Upper Seine, and the Loire.

Brittany and Normandy lie north of the vine limit. In these provinces apples are grown on a large scale and used for making **cider**. The warm climate of southern France makes it possible to grow other fruit trees. The mulberry, olive and orange are cultivated in the Rhone valley. The mulberry is grown for the sake of the silk-worm. Lyons, at the confluence of the Rhone and Saone, is the centre of the **silk** industry.

Though so much attention is paid to cultivation of the soil **pastoral work** and **dairy farming** are not neglected. **Cattle** are fed on the rich pastures of the north and on the poorer land of the Central Plateau. In both areas dairy work is important. The drier pasture land of the chalk hills of Champagne (Seine basin) is used chiefly for the grazing of **sheep**.

The **coalfields** of France are numerous but mostly small. The largest are the north-eastern or Franco-Belgian coalfield near Lille and the Loire coalfield in the Central Plateau. The chief **industrial area** is near the north-eastern coalfield. Supplies of flax from Belgium and wool from the sheep farms of Champagne support the linen and woollen factories of Lille. Many other towns in the district are also engaged in textile work. Amongst them are Roubaix, Arras, Valenciennes, Amiens, Cambrai and Rheims. Iron and steel works are found at Nancy and Longwy, in Lorraine. (Refer to Fig. 131.)

One industrial centre, Rouen, is far away from coalfields. This city and some smaller towns near it are engaged in the cotton industry. The raw material comes from America, through the port of Havre.

France has many fine cities, and the capital, Paris, is one of the most beautiful cities in Europe. On a small hill in the city there is a Triumphal Arch. From this point radiate twelve fine streets or boulevards, planted with trees. Beautiful buildings are numerous.

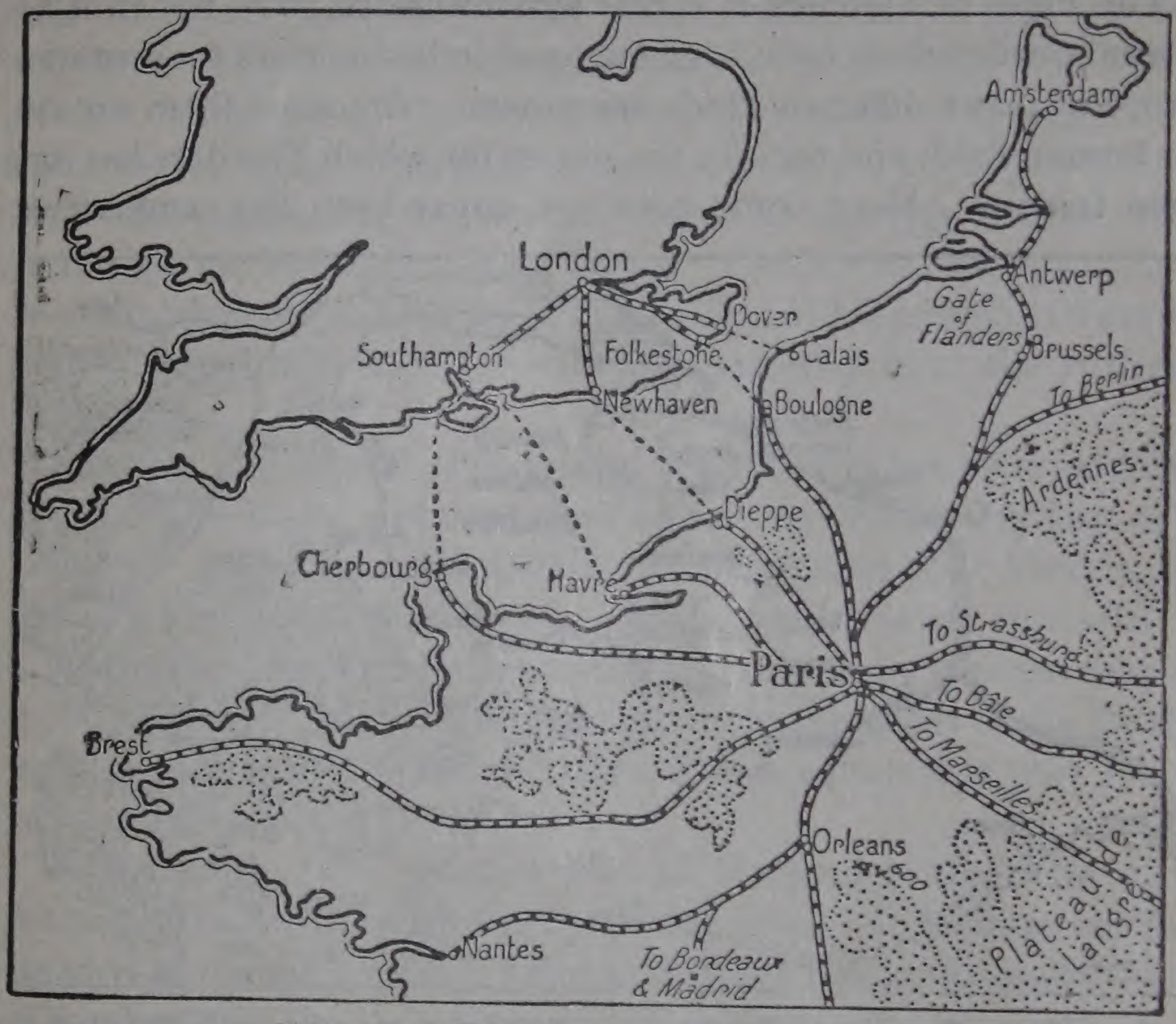


FIG. 130.—THE SITUATION OF PARIS.

Paris is on the Seine, in the middle of a fertile plain, which is partially enclosed by the Plateau de Langres and the Ardennes plateau. Valleys in the plateau provide natural routes which converge on Paris. The Gate of Flanders is a natural route from the European plain. The plain of western France provides easy communication with Spain. Paris has good connections with all the Channel ports. These are connected by steamboat services with English ports. Thus Paris has excellent means of communication with all parts of France, and with most of the European capitals.

One of them, the Louvre, has a magnificent collection of works of art.

Paris is a good example of a "focus town." The city stands where a number of valleys meet. Railways radiate in every direction—to the Channel ports and to the various capitals of Europe.

2. Belgium. With regard to the work of the people, Belgium may be divided into three parts. These are the Plain of Flanders in the north, the Ardennes Plateau in the south, and the Sambre-Meuse valley, which separates the plain from the plateau.

The **Plain of Flanders** is a rich **agricultural** region, but in it are several towns which have been engaged in **textile work** for centuries. Crops of many different kinds are grown. Amongst them are **rye**, for human food, and oats for the horses for which Flanders has long been famous. Next come potatoes, sugar-beet, flax and wheat.

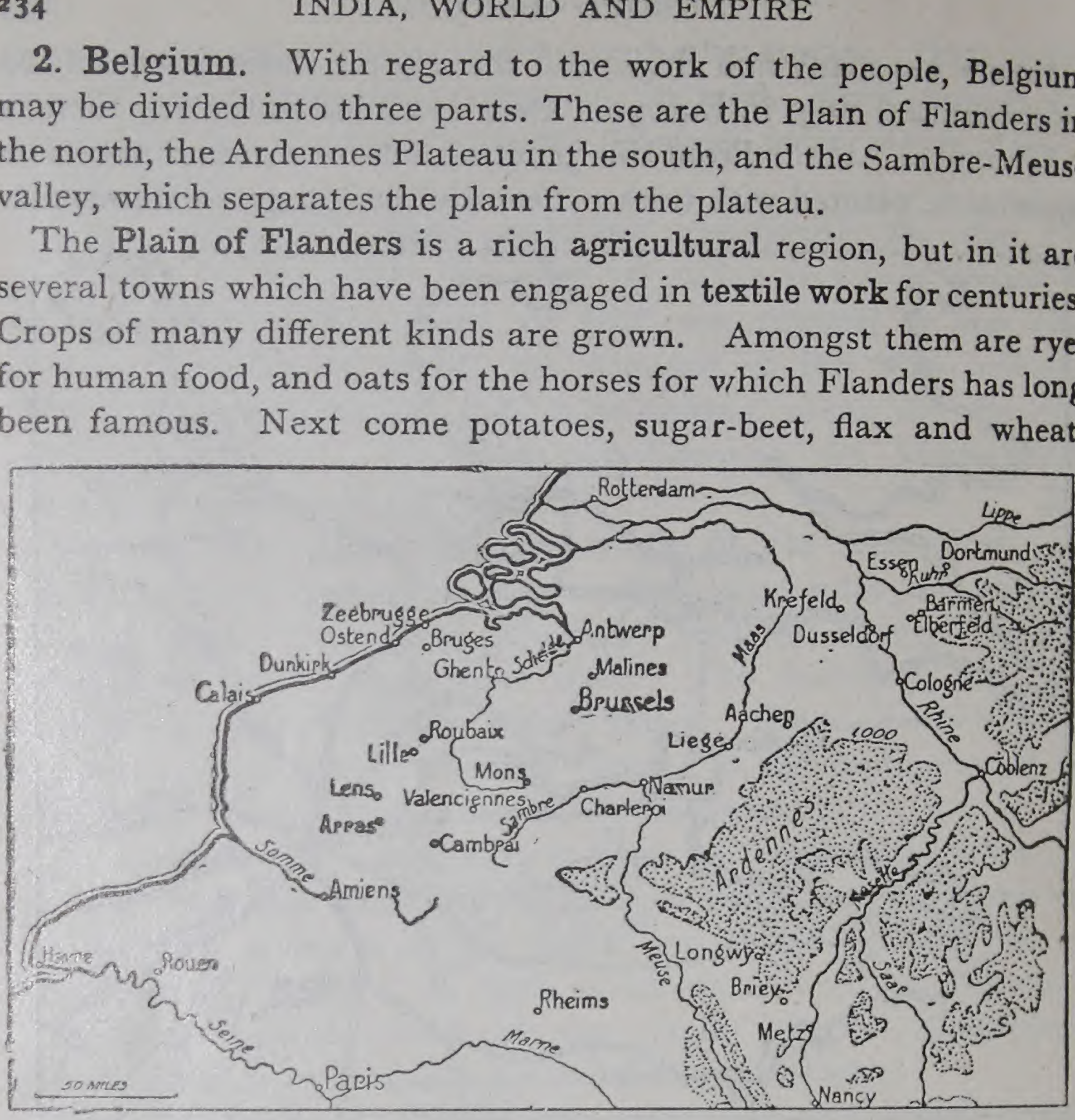


FIG. 131.—THE CHIEF INDUSTRIAL TOWNS IN THE FRANCO-BELGIAN AND RUHR COALFIELDS.

The Franco-Belgian coalfield extends from Lens and Arras through the valley of the Sambre and Meuse to Aachen. The Ruhr coalfield extends from the Rhine eastwards between the Lippe and the Ruhr for about 70 miles. The Saar coalfield lies in the valley near the spot where the name Saar is printed on the map.

Flax is grown partly for export to Northern Ireland, partly to supply raw material to the **linen** mills of the old town of Ghent. This town has also **cotton** mills, supplied with raw material from America. The Flemish women have long been famous **lace-makers**. The industry is carried on in Bruges, Brussels and Malines.

The Ardennes is a region without large towns. The hills provide large pasture grounds for sheep. But every available space in the valleys and on the hill-sides is used for growing food crops.

The Franco-Belgian coalfield stretches completely across Belgium, along the foot of the Ardennes plateau. Its western end is in France, its eastern end in Germany. In Belgium the coalfield lies in the valleys of the Sambre and the Meuse. Ores of iron, lead and zinc are found in the same area. This combination of coal and ores, and water for power and transport purposes, has made the Sambre-Meuse valley one of the busy industrial regions of Europe. The chief towns, Mons, Charleroi, Namur and Liège, are engaged in the **steel and engineering** industries. Some of the largest **glass-works** in Europe are in Charleroi and Liège. Useful sand for this industry is obtained from the Flanders Plain. East of Liège stands Verviers, with woollen mills supplied with raw material from the Ardennes sheep farms.

Brussels, the capital of Belgium, is a fine city near the middle of the Flanders Plain, well connected by railways with every part of the country. Railways from Ostend to Strasbourg and Vienna, and to Cologne, Berlin, Warsaw and Russia, pass through Brussels.

Antwerp is the chief Belgian port, and one of the greatest seaports in Europe. Its great trade is due partly to the needs of the Belgian people, and partly to the fact that it is a convenient port for the industrial regions of Germany.

3. Holland. The western part of Holland is the delta of the Rhine. Much of the land is below sea-level. It is protected from inroads of the sea by sand dunes and dykes (embankments). Plots of land within the dykes are called **polders.** In the north of the country is the Zuider Zee (South Sea). The Dutch people are reclaiming four polders from this sea (Fig. 132).

Since the land is composed of river silt, there are no minerals except in the south-east. Coal is imported from Britain and Germany, and power is also obtained by windmills. Woollen and linen industries are carried on to some extent in the east of the country.

The Dutch have long been interested in the North Sea fisheries and in sea trading. They have inland waterways in the Rhine and a large number of canals. All these are greatly used for merchandise and passengers. Hence it is not surprising that shipbuilding is important. This industry is carried on at the mouths of the Rhine, especially near the great port of Rotterdam.

The country people are engaged mainly in **gardening** and **dairy farming**. The polder land in the west is used for growing bulbs (tulips, hyacinths, etc.), shrubs, roses, vegetables and root crops. All these are exported in large quantities, especially to Britain. Haarlem is known in many countries as a centre for the bulb trade. Dairy farming is carried on in some polders, also in the islands near

FIG. 132.—THE ZUIDER ZEE.

Showing the four Polders (dotted) that are to be reclaimed, the freshwater lake that is to be made, and the line of islands that mark the former coast of the mainland.

the mouths of the Rhine, and in Friesland to the north of the Zuider Zee. Condensed milk, butter and cheese are made for home use and for export.

Amsterdam, like Venice, is a city of canals and bridges. It is a very important centre of the **diamond-cutting** industry. But Amsterdam is mainly a commercial city. It has a large trade with Dutch colonies in South America and the East Indies. The North

Sea Canal. cut across the country to Ymuiden, gives Amsterdam direct connection with the open sea.

The Hague is the political capital, and residence of the Queen. The city is often chosen as the meeting place of international conferences.

4. Denmark consists of the peninsula, Jutland, and a number of islands. The largest islands are Zealand, on which stands the capital, Copenhagen, and Funen. Between these islands and the mainland there are three entrances to the Baltic—the Sound, Great Belt and Little Belt.

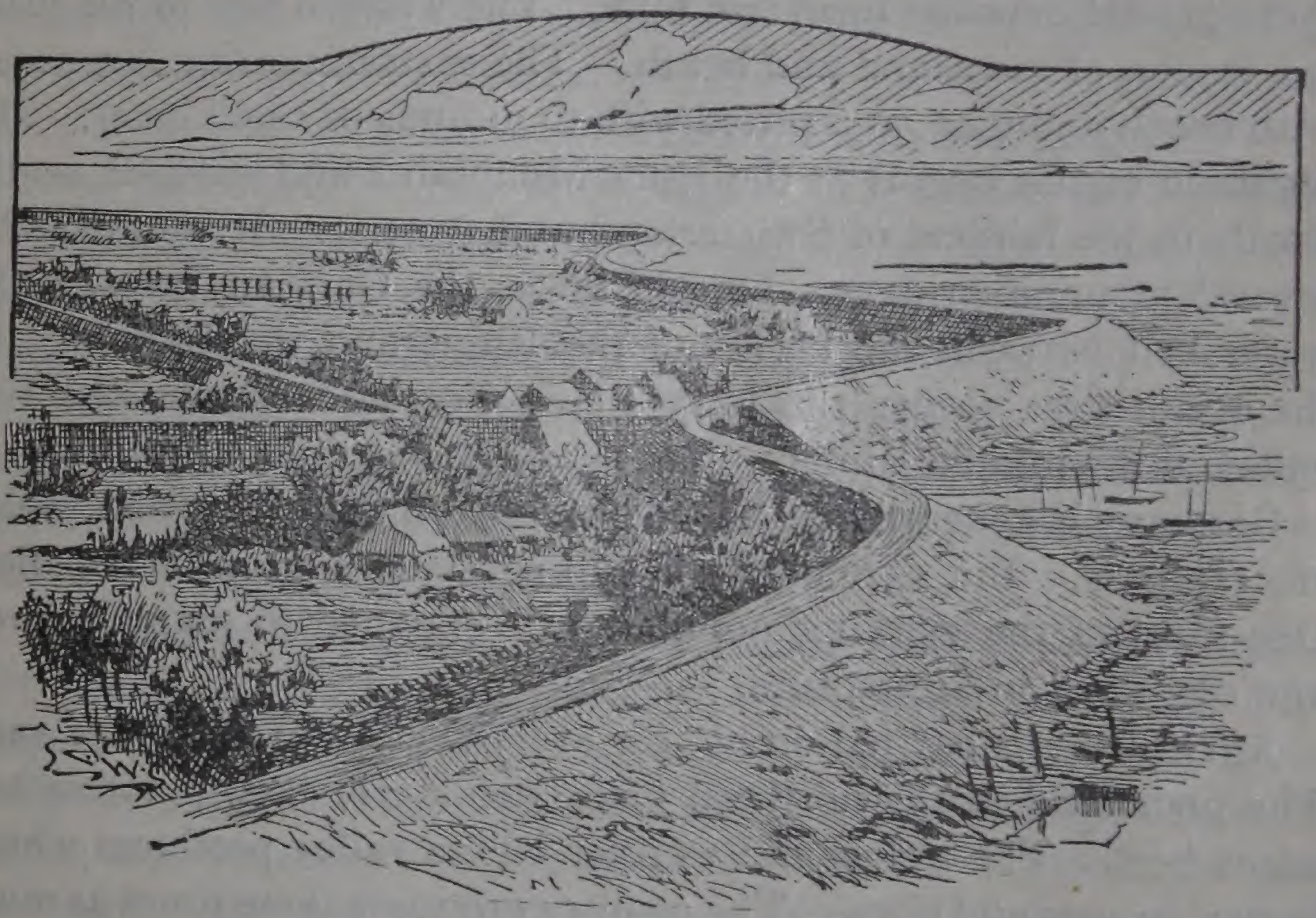


FIG. 133.—DUTCH POLDERS.

The Danes have always been a **seafaring** people. In former times the country produced many sea pirates and raiders. Many people still make their living upon the sea, either as fishermen or sailors. But Denmark is, above everything else, a **country of dairy farmers.** Dairy farming is carried on under a co-operative scheme. The farmers of a particular area send their milk to a central creamery, where butter is made on a large scale.

The dairy industry has led to two others. One is the manufacture of **feeding-cake** for cattle, from soya beans which are imported from China and Japan. The other industry is the **rearing of pigs.**

Skimmed milk returned from the creamery is used for feeding pigs. Denmark has a large export trade in bacon and ham. Large numbers of poultry are kept on most farms, and enormous quantities of eggs are exported. This trade is also carried on under a co-operative scheme. Rye and oats are grown on many farms, and most farmers grow root crops as winter food for their cattle. Most of the textiles and machinery required are imported.

5. **Germany** consists of a northern plain and a southern highland region. **The plain** is a low-lying tract between Holland and Poland, built largely of sand and clay deposited by glaciers. In some places these glacial deposits form low hills. The western end of the plain is a region of moorland and heath. The eastern portion is wooded with beech and pine, and pitted with thousands of small lakes. **The highland region** begins at the Harz Mountains and extends southwards to the borders of Switzerland and Austria. It is crossed by several mountain ridges. One of these, the German Juras, is the watershed between the basins of the Rhine and the Danube. In the south-west corner the lofty Black Forest overlooks the rich valley of the middle Rhine.

Germany is generally described as a great **industrial nation**, which she really is. But **agriculture** is still a very important occupation. One-third of the working population is engaged in manufactures, and one-third in agriculture.

Agriculture is carried on almost everywhere, but the crops vary. The poor land in the northern plain yields rye, oats, potatoes and sugar-beet. The richer and warmer Rhine valley produces wheat, barley, grapes and hops. The country produces three times as much rye as wheat, and rye bread has an important place in the diet of the agricultural people.

The sugar-beet is an important crop. It is used in the manufacture of sugar for export. Large quantities of wine are made, especially in the valley of the Moselle, which joins the Rhine at Coblenz.

Pastoral work is not so important as agriculture. Fewer sheep are reared now than in former times, because much wool is imported. But cattle and pigs are reared in very large numbers. This branch of work receives special attention in all the western part of the country, from the North Sea shores to the Alpine region.

In one branch of land work, **forestry**, the Germans are probably the foremost people in the world. There are tracts of woodland in all parts of the country, but the chief forests are in the mountains. The timber of the high lands has led to the development of special industries in the towns and villages of Bavaria and Wurtemberg. Nuremberg is famous for the making of toys and clocks. At Munich there are important furniture factories. Pianos are made at Stuttgart and also at Coblenz and Berlin.

Germany has three important **coalfields**, the Ruhr coalfield in the basin of the Rhine, the Saxony coalfield in the basin of the Elbe, and the Saar coalfield on the Saar river. These are the most densely peopled parts of the country; they are crowded with towns that owe their importance entirely to manufactures.

The industries of the **Ruhr region** are almost too numerous to mention. They may be grouped under three heads, viz.: **textiles**, the chief centres being Elberfeld, Krefeld, and Barmen; **steel and engineering**, carried on at Essen, Solingen, Dortmund and many other places; **chemicals and glass**, the chief centre of which is Dusseldorf. Another town, Ludwigshafen, much farther up the Rhine valley, has a special chemical industry—the manufacture of dye-stuffs, drugs, etc.

The Rhine is a good waterway for the Ruhr industrial region. Duisburg, Ruhrort, and Cologne have grown into large river ports.

In **Saxony**, there are Chemnitz and Zwickau engaged in textile work, and Meissen, near Dresden, engaged in a special porcelain industry. Not far away from these towns is Leipzig, a famous book-publishing town, and noted as one of the chief fur markets in Europe. The furs come from Siberia. Lower down the Elbe stands Magdeburg, with sugar refineries and electrical workshops.

Berlin, the capital, situated near the middle of the plain, is an important railway centre. It is on the route from the North Sea to the capital of Russia. But the great commercial city of Germany is **Hamburg**, on the estuary of the Elbe. Hamburg is the main outlet for German manufactures, which are sent to all parts of the world, and the inlet for food-stuffs and raw materials. The Kiel Canal joins the Elbe estuary to the Baltic, so putting Hamburg in communication with Baltic ports.

East Prussia, part of the Reich, is separated from the rest by the **Polish Corridor**; this gives Poland access to the sea.

6. **Poland** is the basin of the Vistula. The northern part is continuous with and resembles eastern Germany. In the south the land rises gradually to the Carpathians. This part is very rich in **minerals**, and coal, iron, lead, zinc and salt are mined near Kattowitz and Cracow. Here, in Upper Silesia, are many blast-furnaces, steel-works, chemical works and glass factories. Farther east are rich petroleum wells.

A quarter of Poland is covered with coniferous forest. **Wood-working** is an important occupation, but more than half of the people are engaged in **agriculture.** After the Great War, land was taken by the government and distributed amongst small farmers and peasants. Rye is the most important crop, being the staple food of the people. Smaller quantities of oats, barley and wheat are grown. Sugar-beet is largely grown. There are nearly 100 sugar refineries at work. **Textile industries** are carried on at Lemberg and Lodz. The wool and flax used are produced at home; cotton is imported. **Warsaw**, the capital, manufactures textiles, leather and sugar. It stands where the railway from Berlin to Leningrad and Moscow crosses the Vistula.

The Free City of Danzig was established by treaty after the Great War, to create a port for Poland. Though supposed to be an independent city and state (729 square miles in extent), under the protection of the League of Nations, it is virtually a part of Germany. Danzig is connected by rail and the Vistula with the interior.

III. CENTRAL EUROPE

Central Europe consists of five countries—the republic of Switzerland, the kingdoms of Hungary and Rumania, and Austria and Czechland which are now part of the German Reich. Four of these have no coast, but Rumania has a comparatively short coastline on the Black Sea. Hungary is a great plain around the middle Danube and its tributary the Theiss. Rumania is half plain and half mountain land. The other three countries are very mountainous. Climate generally is moderately dry and rather extreme, being greatly modified by altitude.

1. Switzerland has three physical regions—the Jura mountains in the north-west, and the complicated Alpine mountains in the south, separated by a hilly plateau that stretches from Lake Geneva to Lake Constance. All the important towns are on the plateau.

Switzerland has no coastline. This has encouraged the manufacture of small articles, such as watches and wood-carvings, which can be transported through foreign countries at low cost. Much of this work is done in mountain villages. Villagers in the Juras work

FIG. 134.—A SWISS VILLAGE IN THE ALPS.

in connection with watch-making factories in Geneva and Neuchatel.

More than a quarter of Switzerland is unproductive mountain land. The rest of the country is one-third agricultural land, rather less than one-third forest, and rather more than one-third pasture land.

Agriculture is of minor importance. Wheat, oats, rye, potatoes, and sugar-beet are cultivated everywhere on the plateau, and where possible amongst the mountains. Grapes are grown in the valleys and on sunny mountain slopes. But the main occupation of the country people is **dairy farming.**

During the winter cattle and goats are housed in the valley Early in summer the animals are driven into the Alp pastures, abo the forest belt on the mountains. The herdsmen live in wooden hu or chalets, where butter and cheese are manufactured. Much mi is condensed at such towns as Lausanne and Vevey on Lake Genev or used in the great **chocolate industry** of Switzerland.

Swiss **textile industries** are in a flourishing condition. Silk an cotton goods are manufactured at Zurich, Bâle, St. Gall and oth towns on the plateau. All Swiss industries have been greatly aide by the harnessing of alpine rivers to generate electricity. Even i small villages houses are lighted by electricity. The developme of this work has led to a special industry, the making of electric machinery in Berne and Zurich.

There is another industry of great importance, and that is th **tourist industry.** The magnificent scenery formed by jagged snow capped peaks, glaciers, waterfalls, lakes, and winding mounta roads, attracts many thousands of holiday-makers from ma European countries and America. Tourist centres are genera small towns with large hotels. Amongst them are Zermatt, nea Monte Rosa and the famous Matterhorn, and thirty other peaks ov 12,000 feet high; Interlaken, commanding a view of the Jungfra Lucerne, at the foot of a beautiful lake of the same name.

Foreign trade has always had to fight against costly transport ov land. But Rhine navigation has now been extended to Bâle, 8o miles from the sea, and docks were constructed at this town i 1926-7. Swiss merchants have therefore the advantage of direc water communication with the North Sea.

2. Austria. More than half of this country consists of a rugge alpine region, in which there is a large amount of unproductiv land. But it contains some of the finest scenery in Europe, and i greatly visited by tourists. The inhabitants of this region ar engaged in the **tourist industry, pastoral work** and **forestry.** Foo crops are grown in the valleys, and the villagers make most of th cloth they require for clothing. The only large town in the Alpin region is Innsbruck. This town developed at a bridge over th river Inn, as the chief market for the district. Its growth wa assisted by trade over the Brenner Pass, from Venice. It is also a convenient centre for tourists in the Tyrol, as this region is called.

The only low land in Austria is a small area near the Danube. Here is the capital, Vienna, a fine city on the Orient Express route. Vienna has been called the "natural capital of Europe." It commands routes leading to all parts of the continent. Bronze and iron goods are manufactured in the city, as well as cloth, leather, paper and fancy goods.

Further up the Danube stands Linz, where two valleys lead up into the mountains. In one of the valleys is Steyr, where iron ore from the mountains is smelted. In the other valley there is Salzburg

FIG. 135.—THE SITUATION OF VIENNA.
Vienna is situated on the Danube, at the point of convergence of routes from nearly every capital in Europe.

(salt town), named from the large salt deposits in the district. Salt is mined for the industries of Linz, but Salzburg is perhaps more famous for the beautiful scenery in its neighbourhood.

3. **Hungary.** East of Austria lies the rich plain of Hungary, occupied by the Magyars, who belong to the yellow race. Hungary is a **land of villages and farms.** Half of the people are engaged in agriculture. Many of the farms, known as "dwarf holdings," consist of but two fields. No less than two-thirds of the country is ploughed land. The rest is pasture or forest.

The Hungarians have three great festivals, the Vintage, th Harvest Home, and the Pig-killing—celebrated with music an dancing. These indicate plainly the activities of the people. Frui growing, corn-growing, wine-making and animal-rearing chief occupy their attention. Wheat and maize are the chief crop The wheat crop is sufficient for a population three times that o Hungary. The surplus is exported to adjoining lands. For th purpose the Danube is a valuable means of transport. Next i importance come grapes, sugar-beet, potatoes and rye. Grapes ar used for making wine in the northern part of the country.

Pastoral work receives attention on the natural pastures. I addition to pigs, there are large numbers of sheep, cattle and horse in the country. Many pastoral workers lead a semi-nomadic life.

Budapest, the capital, is the commercial, industrial and educa tional centre of the country. It really consists of two cities. Buda on the right bank of the Danube, is very ancient, and Pest, on the le bank, is modern. The two are connected by fine bridges. Railway from various parts of the country converge upon the capital. The bring in the produce of the plain—grain, wool, wine, fruit, cattle and hides. Some of these are exported, others go to the flour mills leather works and other factories of the city.

4. **Rumania** consists of two regions, the Transylvanian plateau and the plain of the lower Danube and its tributaries, the Sereth and the Pruth. **Transylvania** is a region of forests, oil-wells, salt-mine and minerals. The population is small. Most of the workers are engaged in lumbering or mining. The oil-fields provide work fo 50,000 men. Salt-mining is a state monopoly.

The Rumanian plain is a **region of farms.** Since the Great War large areas of land have come into the hands of the peasants. Agri culture is the most important occupation. The climate is very suitable for cereals, and the Black Earth land, in the basins of the Sereth and Pruth, is some of the best wheat land in Europe Rumania's surplus of wheat is equal to the whole amount grown in Hungary. Maize is the second crop, grown to feed the horses cattle and pigs reared on the farms. Next come grapes, root crops and tobacco.

The Danube, an international waterway, is a most important means of communication There are few towns on its banks

because the ground is often swampy. But Galatz and Braila are large river ports. Bukarest, the capital, is on a small tributary of the Danube. The city is connected by railway through the Iron Gate with Central Europe.

IV. THE SCANDINAVIAN PLATEAU

The Scandinavian plateau is divided between the kingdoms of Norway and Sweden. **Norway** is a narrow, very rugged land, penetrated by innumerable fiords. All the people live within reach of the sea. When making even short journeys, they are generally obliged to travel by water. Hence Norway is a land of fishermen and sailors. Many kinds of fish are taken in Norwegian waters, the chief being cod and herring. The catches are landed at various ports, such as Hammerfest and Bergen. Here large numbers of people are employed in drying or salting the fish, extracting cod-liver oil, and packing fish for export to southern Europe.

Agriculture and pastoral work are not neglected. The nature of the country makes pastoral work the more important. Cattle are grazed on the mountains in summer, and the herdsmen lead a life similar to that of the Swiss herdsmen. **Forestry** engages the attention of some people. The mountains behind the capital, Oslo, are clothed with coniferous trees. Timber and wood-pulp are exported from Oslo and Drammen. The Norwegians have no coal, but they have plenty of **water power.** This has been harnessed to work sawmills, chemical factories and railways.

Sweden is the wider eastern slope of the plateau. The country contains valuable stores of iron ore. These are worked near Falun, north of Lake Maelar, and in the far north near Gellivara. Much of the iron ore is exported to Britain. The southern part of Sweden is a lowland region where **agriculture** and **dairy farming** are carried on. Oats, rye and barley are grown, rye being generally used for bread-baking. Cattle-rearing and dairy work have, however, become more important than agriculture.

More important still are **forestry** and **woodwork**. More than half of the surface of Sweden is covered with coniferous forest. The rivers provide means of transport for logs and power to work sawmills and pulping mills. Along the Baltic coast there are 1400 sawmills, providing employment for 44,000 people. Nearly 30,000

more are engaged in pulping mills and paper factories. Another 12,000 people are at work in joinery factories, making doors, window-frames and other articles. In addition there are large match-making factories and shipbuilding yards.

Stockholm, the capital, is built on islands at the eastern end of Lake Maelar. It is connected by railway with Göteborg, a large seaport on the shores of the Kattegat. Stockholm suffers as a port because its harbour is ice-blocked during the winter months.

V. THE EASTERN END OF THE GREAT PLAIN

Before the Great War the Russian empire extended from the Baltic shores to the Pacific. Thus it included the eastern portion of the European plain and the Asiatic plain north of the mountain region

In 1917 revolution converted the Russian empire into a number of republics. Some of these—Poland and the Baltic Republics—are independent. The rest are united as the **Union of Soviet Socialist Republics**. This union includes Siberia, Central Asia and a number of republics west of the Urals and Caspian Sea.

Siberia and Central Asia will be dealt with in the chapters on Asia. In this chapter " Russia " will be used as a convenient name for the Soviet republics west of the Urals line.

The Baltic Republics are : Finland, Esthonia, Latvia, Lithuania. **Finland** is a land of pine-clad hills, state forests, lakes and rushing rivers. Snow lies on the ground from November to April. Then follows a short spring and hot summer. The conditions are not very favourable to agriculture, but parts of the country have been cleared and sown with oats and rye. Along the shores of the Gulf of Bothnia there is even a little wheat (Fig. 126).

The Finns are actively engaged in work connected with the forests—cutting and dressing timber and the manufacture of wood-pulp and paper. The chief towns, Helsingfors and Abo, owe their importance to their export trade in these goods.

Esthonia, Latvia and Lithuania are small republics south of the Gulf of Finland. At one time the whole region was forested. Each country still possesses good stocks of timber, and many people are engaged in timber industries. **Reval, Riga and Memel** are the timber ports.

The remainder of the working population is engaged chiefly in **agriculture, dairy farming** and **poultry rearing.** Each country has large areas devoted to **flax.** Much of this fibre is exported, to be used in the linen factories of Belgium. Lithuania has a large export trade in eggs. The crops raised, for home consumption, are rye, oats and potatoes.

Russia. The central part of Russia is a low tableland, sloping gently towards the Arctic Ocean, the Baltic Sea, and the Black and Caspian Seas. The longest river of Europe, the Volga, rises on the tableland and flows into the large inland sea—the Caspian.

Russia is **a land of extremes.** It is a huge country with a short coastline. It has a larger population than any other European country, but, except for Scandinavia, it is the most thinly peopled. It has hot summers and very cold winters. It has magnificent forests in the north, and wide treeless steppes and some desert in the south. Its natural resources are almost unlimited, but the lowest classes of its people are the poorest in Europe.

Russia has great stores of **mineral wealth.** There are large coalfields (*a*) in the valley of the Donets, north of the Sea of Azov, (*b*) in the valley of the Oka, near the middle of the country, (*c*) near Perm, in the Ural district. Iron ore is found on each coalfield, whilst silver, gold, platinum and other metals are obtained in the Urals. In addition, there are very valuable oilfields in the Caspian region around the town of Baku.

This mineral wealth has led to the development of the **textile, steel and engineering industries** in several places, the chief of which are Leningrad and Moscow. All the industries named are carried on in these cities. Russia has a special advantage in being able to produce raw materials for the textile industries. Cotton comes from the region east of the Caspian ; wool, hair, and hides from animals reared on the steppes ; and flax from the land near the Baltic.

But the Russians are not an industrial people. More than three-quarters of the population depend upon **agriculture.** During the revolution which began in 1917, estates having an area 60 times that of Ceylon were distributed amongst the peasants. Russia thus became a **country of small farmers.**

Variations in climate produce variations in crops. These we may best observe by going through the country from north to south.

Fringing the Arctic shores, there is a belt of **tundra** which provides nothing but reindeer pastures. South of the tundras there is a broad belt of **coniferous forest.** There is little agriculture in this belt. People are engaged in **lumbering** and hunting fur-bearing animals. Practically all the **furs** obtained are exported to Britain and the United States, these countries taking about equal quantities. **Timber** is exported from Archangel.

South of the coniferous forest comes a wide belt of **deciduous forest.** Much of this has been cleared for cultivation. The crops grown include the more hardy cereals—rye and oats—potatoes, flax, and sugar-beet.

South of the deciduous forest there is the **Black Earth Region** of Russia. This is the richest land in the country The soil consists of material carried south by glaciers during the Ice Age and distributed by floods due to the melting of the ice. The Black Earth stretches from the Rumanian boundary to the Volga. In this belt are to be found most of the Russian peasant farmers, living in cottages built of wood and thatched with straw or turf. The hot summer makes it possible to grow wheat. This grain is raised over large areas. Some is exported from Odessa. Some is sent in barges up the Volga as far as possible, then by train to Leningrad. Barley, oats, rye, potatoes, and sugar-beet are also grown.

South of the Black Earth belt there is the **Crimean Peninsula** and the shorelands of the Black Sea. Here the climate is warm enough for the olive and the vine. In addition, this region produces maize, tobacco, and many kinds of fruit.

The Steppes occupy the south-eastern part of the country, and extend far into Asia. Deficient rainfall makes agriculture difficult. The region is peopled largely by nomads, who rear sheep, goats, camels and horses.

Fishing is an occupation of some importance. The river Volga and the Caspian Sea are the chief sources of supply of fish. The sturgeon fishery of this region is especially valuable.

Moscow, the capital of Russia, is centrally situated. The city is connected by rail with all parts of the country, and it is the terminal of the railway which crosses Siberia.

Leningrad, the former capital, is a fine city on the Neva. As a port it suffers because the Baltic is ice-blocked in winter. **Archangel**

has a handicap of the same kind, and Astrakhan is the port for a land-locked sea.

EXERCISES

1. What are the chief points of difference between the crops grown on the European plain and those grown in the Mediterranean region ? Name the products of each region.

2. Draw sketch maps showing the situation of Paris, Berlin, Maárid, Rome. Account for the growth of these cities. Which has the best position as a capital ?

3. Which European countries export wheat, dairy produce, timber, manufactured articles ? Give reasons in each case.

XXIX. THE BRITISH ISLES

Ages ago the continent of Europe extended much farther west. It included the British Isles. Sinking of the land took place, and the sea flooded some low-lying areas. These are now the North Sea, English Channel and Irish Sea. Their waters are not more than 600 feet deep ; in some places the depth is only 60 or 80 feet.

The British Isles are therefore the unsubmerged portions of the **continental shelf** of Europe. They consist of two large islands—Great Britain and Ireland—and hundreds of smaller islands, some of which are mere rocks. Scotland, the northern part of Great Britain, is a little larger than Ceylon. England has twice the area of Ceylon. England, Wales, Scotland and Northern Ireland form the **United Kingdom**. Southern Ireland, now called the **Irish Free State**, has the status of a dominion. (Refer to p. 55.)

I. SURFACE RELIEF

(*a*) **Scotland** has three physical divisions : the Highlands, the Central Valley (or Lowlands), and the Southern Uplands.

The Highlands are composed of hard ancient rocks. The surface of the land has been made very irregular by the action of ice and rivers, and the west coast is broken by many fiords. Swift rivers, such as the Spey, Dee, Tay, and others, have cut deep valleys in the plateau. During the Great Ice Age, glaciers scooped out valleys, and made hollows which filled with water and formed lakes.

Northern Scotland is therefore a region of rugged mountains covered with heather, narrow wooded valleys called "glens," rushing streams and innumerable lakes. It is a thinly peopled region. The highest peak, Ben Nevis (4406 feet), is the greatest mountain in the British Isles. It does not reach the snow-line, so there are no glaciers in the British Isles. Off the west coast of Scotland there is a chain of islands called the Hebrides. These, and the Orkneys and Shetlands which lie to the north, must have been mountains wher Britain was joined to Europe.

FIG. 136.—THE MOUNTAINS AND HILLS OF GREAT BRITAIN.
The broken lines show the lines of hills which run across the south-eastern plain.

The Central Valley of Scotland is a rift valley, formed long before man appeared on the earth. It is very small compared with the rift valley of Africa, but it was formed in the same way (see page 54). Soon after the formation of the rift, volcanoes burst into activity. They threw up a line of hills almost along the centre of the rift, thus dividing it into two belts. Nearly all the Scottish coalfields are in the southern belt of the rift valley. Three rivers flow through the Central Valley. Two of them, the Tay and the Forth, flow from the Highlands into wide estuaries on the east coast. Their valleys provide routes into the Highlands. The third river, the Clyde, flows from the Southern Uplands into a wide estuary on the west coast.

The Southern Uplands is a region of hills and valleys. The highest point is less than 3000 feet above the sea. There are stretches of moorland in some places, but many of the hills are covered with grass to the summit. They form good pasture

grounds for sheep. The chief rivers, Clyde and Tweed, have cut broad valleys in the uplands. South of the Tweed are the Cheviot Hills, through which runs the boundary between Scotland and England. Smaller rivers, Esk, Annan and Nith, flow into the Solway Firth. Their valleys form useful routes through the hills, from Carlisle to Edinburgh and Glasgow.

(*b*) **England** may be divided into two portions by a line from Start Point in the English Channel to Flamborough Head in the North Sea. On the north-west side of the line are found the mountain areas; on the south-east side lies the English Plain, crossed by lines of low hills. (Refer to Fig. 136 and *Oxford Indian School Atlas*, pp. 34-5.)

The mountain regions of England are four in number—the Pennines, the Lake District, the Welsh plateau, and the south-western peninsula.

The Pennine uplift is a system of fold mountains, not more than 3000 feet high. It stretches from the Cheviots through northern England, being rather nearer to the west than the east coast. The Pennines have been much dissected by rivers, and they also bear traces of ice action. The Tyne, Wear, Tees, and the Ouse with its many tributaries, flow down the longer eastern slope to the North Sea. Somewhat swifter streams, the Eden, Lune and Ribble descend on the western side. Two breaks in the mountains should be noticed. These are the Tyne Gap and the Aire Gap. They provide routes for roads and railways from one side to the other.

The Lake District mountains are joined to the Pennines by a high ridge called Shap Fell. The Lake District mountains form an irregular group. This is the result of the dissection of a dome-shaped uplift. Rivers flow outwards from the central portion. Thus valleys, containing chains of lakes, are arranged like the spokes of a wheel. Some of the mountains were formed by volcanic action ages ago. The district is famous for its beautiful scenery.

The Welsh plateau is an irregular mass of high land, deeply dissected by rivers. The highest mountain, Snowdon, in the north, is the greatest peak in the southern part of Great Britain. Its altitude is 3571 feet. The chief river, the Severn, rises on a mountain near Cardigan Bay. It flows to the interior, and, after a course of over 200 miles, enters the Bristol Channel. Between the Welsh plateau and the southern end of the Pennines there is a very useful

gap called the Cheshire Gate. It gives access from the English plain to north-west England.

The South-western Peninsula consists of the counties of Cornwall and Devon. The surface of the region is very irregular. This is due to the presence of large masses of granite amongst the sedimentary rocks. The hard granite areas stand up as hills. The largest one is Dartmoor, near the middle of Devonshire. Exmoor, in the north of the same county, is another hill region, but it is composed of sandstone. The rivers of the peninsula are small. They are more noteworthy for beautiful scenery than for commercial value. The peninsula ends in a bold rocky headland called Land's End.

The English Plain is the south-eastern portion of the country. It includes about half of England and Wales. The plain is not simply a stretch of level land. It is crossed by several ridges (escarpments), which, however, do not generally rise to more than 1000 feet.

One of these ridges is composed of limestone. It is seen in the Cotswold Hills near the Severn estuary. Following it across the plain, we find it dwindling in height, and sometimes disappearing altogether. But the northern end is well seen in the Yorkshire Moors, which reach an altitude of 1400 feet.

About 20 miles east of the Cotswolds there is a hilly area called the Marlborough Downs. This is the starting-point of several chalk ridges. One can be traced through the Chiltern Hills. Then it begins to decrease in altitude, and it is completely broken at the Wash and the Humber. Its northern end is seen in the high cliffs of Flamborough Head. Two other ridges, running from the Marlborough Downs to the east, are the North Downs and the South Downs. One ends in the Dover cliffs and the other at Beachy Head.

The largest rivers of the plain are the Severn, Thames and Trent. The Severn comes from the Welsh plateau. Its valley provides a convenient route into Wales from the plain. The Severn reaches the sea by a funnel-shaped estuary noted for a strong tidal wave. The Thames rises in the Cotswolds, and meanders past the university town of Oxford. Then it passes through a gap in the chalk ridge, and continues its meandering past Windsor and London to the North Sea. The Trent describes a large curve round the southern end of the Pennines, and pours its waters into the Humber.

(*c*) **Ireland** has a highland region in the north, another in the south and a low-lying plain between them. The rugged highlands in the north-west and west are composed of the same kind of hard ancient rock as the Scottish highlands. Two highland areas are found on the eastern side. One is the Antrim basalt plateau in the north-east corner, and the other is the Wicklow mountains, composed largely of granite, in the south-east. The greatest mountain system, in the south-west, consists of a number of ranges, almost parallel to each other. Between the ranges are long, submerged valleys—Dingle Bay, Kenmare Bay and Bantry Bay (Fig. 141).

The central plain is composed of limestone. In many places the rock has dissolved under the action of rain and rivers. This has occurred along the course of the Shannon, the largest Irish river. The hollows thus formed may be seen on the map as lakes Ree and Derg. Many of the hollows in the limestone contain a mass of vegetable matter, mosses and other plants. Pressure has converted this matter into peat, which is cut, dried, and used as fuel. The river Liffey rises in the Wicklow mountains and flows through the eastern part of the plain to Dublin Bay. This is the chief entrance to Ireland from the east. Naturally the capital, Dublin, was established on the Liffey at the head of the bay.

II. CLIMATE AND VEGETATION

The climate of the British Isles is very different from that of India generally. But as regards temperature, Britain may be compared with places in the Himalaya, 7000 to 8000 feet above sea-level. The mean monthly temperature in London is 38·7° in January and 62·8° in July. At Simla, the average temperature in January is 38·8°, and in June (the warmest month) 66·9°.

The climatic year of Britain consists of four seasons. Summer is fairly warm, winter is cool. Summer is preceded by spring, when plants awake from their winter rest; trees and shrubs burst into bud. After summer comes autumn, when most of the trees shed their leaves.

The annual range of temperature in London is 24°. In other parts of the islands the range is less than this. The London district is slightly affected by nearness to a large land area. The climate

of the British Isles may be described as a cool equable climate. It is much less severe in winter, and cooler in summer, than that of parts of Europe and Canada in the same latitudes.

This is due to several causes. (1) The seas around Britain have a tempering influence; they reduce winter cold and summer heat. (2) The North Atlantic Drift brings warm waters to the region from lower latitudes. (3) The prevailing winds are from the west and south-west. They bring oceanic influences during most of the year.

Since winds come mainly from the ocean, the air generally is damp. There is much cloud in summer as well as at other seasons. The British Isles have rain at all seasons, though most falls during the winter months. Much of the rain is brought by low-pressure systems (cyclones) from the Atlantic.

The rain-bearing winds encounter first the highland areas of the islands. Consequently the western side of both Great Britain and Ireland is wetter than the eastern side. London has only 25 inches rainfall per year, but Plymouth has 40 inches, whilst places in the Lake District and the west of Scotland have 80 to 100 inches.

The climate of the British Isles is very favourable to tree growth. At one time very large areas were covered with forest. Most of the land has long been cleared for agriculture. The trees of southern Scotland, England and Ireland are mainly of the **deciduous** type—oak, elm, beech, etc.—whilst **coniferous** trees distinguish northern Scotland. Large numbers of conifers are, however, grown in all parts of England. **Fruit trees**, such as the apple, pear, plum, cherry, are widely grown. The higher mountains of Scotland, England and Wales are clothed with heather—dull brown in winter, but brilliant purple in late summer. Such areas are called "moorland."

III. LIFE AND WORK OF THE PEOPLE

Four or five hundred years ago the British were a nation of farmers. At the present day they are described as an **industrial and commercial people.** This does not mean that farming has died out. Agriculture, and every other occupation that can be named—except plantation work—is carried on in Britain. But three-quarters of the people are dependent upon manufacturing industries. They are town-dwellers. They are employed in

factories, workshops, warehouses and offices. The agricultural portions of the country are not so densely peopled as those of India or China.

Britain became an industrial land for several reasons. (1) The country possessed large stores of the most valuable minerals—**coal and iron.** (2) Large sheep farms provided raw material for the cloth industry. (3) There were men who devoted their time and thought to the invention of machines. Spinning machines were

FIG. 137.

Why does Great Britain buy food-stuffs and raw materials all over the world? The answer is given in the map.

invented which would do as much work as hundreds of hand-spinners. (4) The **climate** of Britain, being equable and cool, encourages activity in the people.

Factories produced more articles than the British themselves required. Manufacturers therefore had to find **buyers in other lands.** Thus factory work stimulated commerce; and as commerce developed it stimulated factory work in its turn.

So it came to pass that the factories required more raw material than Britain can produce. Wool has long been imported from **Australia, New Zealand and other countries; iron ore from Spain,**

and so on. In addition, the factories use raw materials which cannot be grown in England. Amongst these are cotton and jute, one imported from America, Egypt and other lands, and the other from India. (Refer to Fig. 137.)

Most of the factories and workshops are built in coal-producing areas. These are therefore the most thickly peopled parts of the country, apart from London. Hence in naming the coalfields we name the areas where the large towns are situated, and where the chief work of the country is carried on.

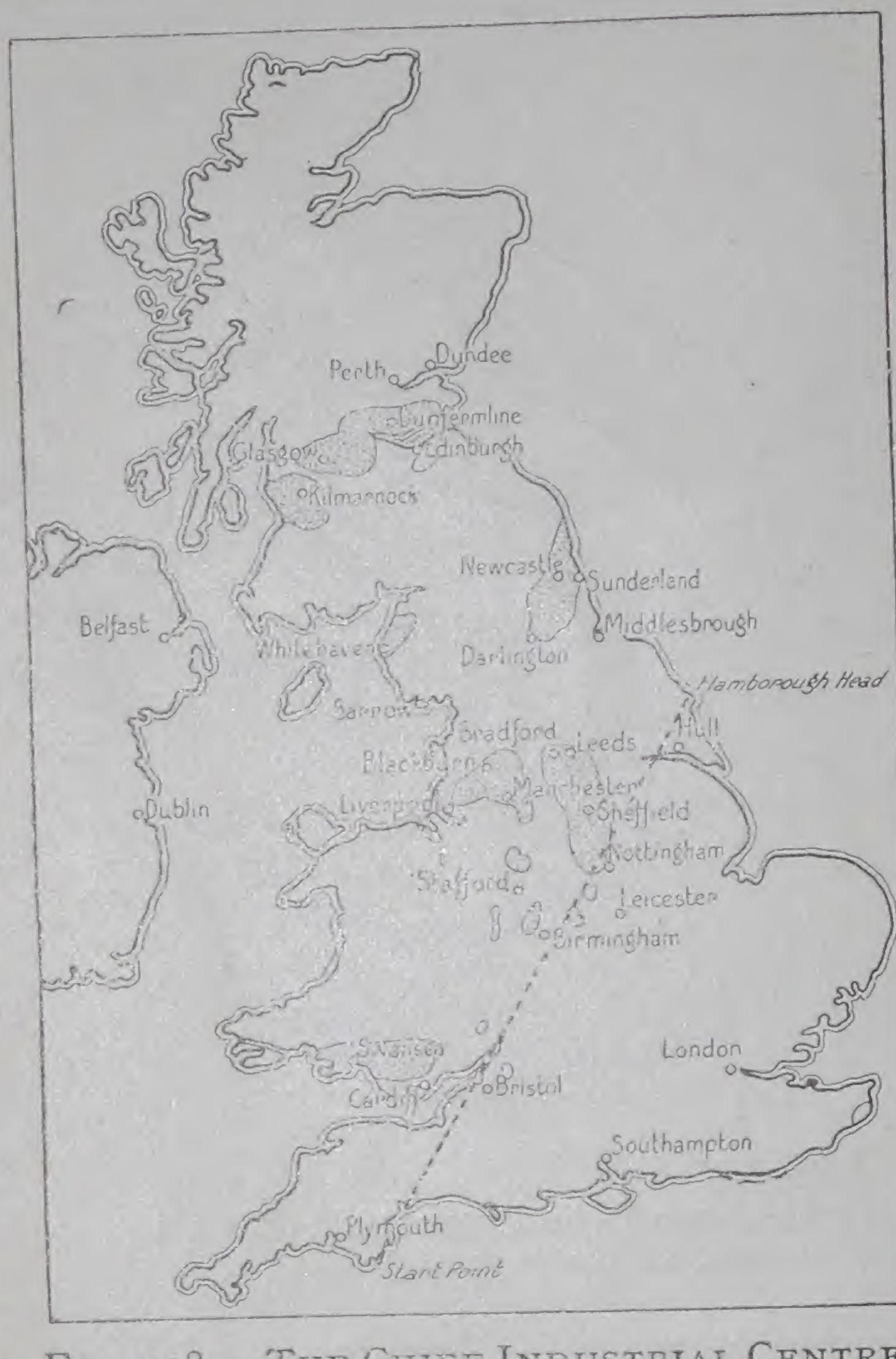


FIG. 138.—THE CHIEF INDUSTRIAL CENTRES IN THE BRITISH ISLES.

Most of them lie north-west of the line joining Start Point to Flamborough Head. (Dotted areas denote coalfields.)

The Scottish coalfields are in the Central Valley. Ireland has little coal, but Belfast, a large linen and shipbuilding town, obtains coal from Scotland.

In England all the coalfields, except a small one in Kent, are in the north-west half of the country. Two large coalfields lie on the east of the Pennines—the Durham and the Yorkshire coalfields. Three others lie west of the Pennines. They are the Cumberland, Lancashire and the North Stafford coalfields. Half a dozen smaller coalfields are in the Midlands, a large one is in South Wales, and a small one near Bristol.

One industry leads to another. The cotton trade, for example, requires machinery, bleaching powder, dyestuffs and other things. Shipbuilding towns need steel plates, engines, cables, etc. Thus

we find several industries carried on in each area. Industries also lead to an overseas trade, and each industrial area has its seaports.

Industrial Regions.

[*N.B.*—The reader should draw a rough sketch map of each of the regions described below.]

The northern part of England is often called "the industrial north." This is because most of the people are engaged in some

FIG. 139.—SKETCH MAP SHOWING THE DISTRIBUTION OF THE CHIEF INDUSTRIAL TOWNS IN THE NORTH OF ENGLAND.

branch of manufacture. Two large industrial areas, the Durham coalfield and the Yorkshire coalfield, lie east of the Pennines. On the opposite side of the mountains there is the Lancashire coalfield and the smaller Cumberland coalfield. Each region has its special industries.

The Durham coalfield has several great industries—shipbuilding, the manufacture of chemicals, iron and steel, and engineering. Home supplies of iron ore are not sufficient. Large quantities are imported from Scandinavia. Three river estuaries, the Tyne, Wear

and Tees, provide suitable places for launching ships. Newcastle on the Tyne, Sunderland on the Wear, Middlesbrough and Hartlepool on the Tees are well known shipbuilding towns. In addition, each has large engineering works and steel works. Both Newcastle and Darlington specialise in the building of railway engines.

The Yorkshire coalfield is the chief area in Britain for the manufacture of woollen goods. Leeds, Bradford, Halifax and Huddersfield are the most important centres. Rivers from the Pennines provide water for industrial purposes, and at one time sufficient wool was obtained from the sheep reared on the Pennine hills. Now, much wool is imported from Australia, New Zealand and other lands. Machines used in the woollen trade, engines, electrical machinery, chemicals, and steel are made in the towns named and in the surrounding district. But the most important steel-making town is a little farther south. It is Sheffield, known all over the world for its excellent cutlery.

The cotton industry is carried on at a large number of towns on the Lancashire coalfield, which is on the wetter side of the Pennines. This region has many advantages. The climate is rather damp, so that it is unnecessary to adopt artificial methods of damping the air in factories. The coalfield provides ample supplies of fuel, and from coal-tar products a large number of dyestuffs are manufactured in Manchester. Rivers from the Pennines provide water. A little farther south (in Cheshire) there are large deposits of salt. These are the basis of a chemical industry which provides bleaching powder for the cotton trade. One thing the country cannot produce, that is the raw material. All the cotton used in Britain is imported from the United States, Egypt and other lands.

The cotton manufacturing towns, Blackburn, Oldham, Bolton, Bury, and many others are mostly situated beside rivers. They almost form a semicircle, at the centre of which is Manchester, the chief business centre of the cotton trade. Liverpool was formerly the port for this large industrial region. The trade is now shared with Manchester, which is joined to the Mersey estuary by a ship canal. Near Liverpool there are large shipbuilding yards.

On the Cumberland coalfield there are iron and steel works at Whitehaven and Workington. But a very busy town, not on any coalfield, is Barrow-in-Furness. The growth of this town is due

to the discovery of iron ore in the district. Barrow has some very important shipbuilding yards and gun factories.

The pottery industry of England is located on the North Stafford coalfield. This lies on the western side of the southern end of the Pennines. The district possesses valuable clay, and it is quite close to the salt beds of Cheshire. The finest pottery clay is, however, obtained from Cornwall. It is sent by sea to Liverpool, and then by canal to the pottery towns—Burslem, Stoke and others.

The central part of England is another busy industrial region. Here many towns have developed on the Midland coalfields. They are distributed over a wide area. On the Trent there is Nottingham, with factories for lace and bicycles. Some miles to the south stands Leicester, which has a special trade in hosiery (woollen and cotton underclothing). But the most thickly peopled area is that around Birmingham, Coventry and Wolverhampton. It is generally known as the Black Country, because of its many furnaces and workshops. This district produces metal goods of all kinds—pins, needles, pens, fish-hooks, pans, chains, engines, bicycles, motor-cars—almost every metal article one could mention.

Another metal-working area, of a rather different kind, is the **South Wales coalfield.** Merthyr Tydfil, Swansea, and other towns are centres for iron-smelting, steel-making, the manufacture of tin-plate and copper working. At one time the iron ore was obtained from the coalfield, and the ores of tin and copper from the south-west peninsula on the opposite side of the Bristol Channel. Local supplies are almost exhausted. The furnaces and workshops use iron ore imported from Spain, tin ore from the Malay Peninsula, and copper ore from Australia. South Wales coal is excellent in quality. Much is exported from Cardiff, Port Talbot and Swansea to coaling stations for ships in different parts of the world.

Bristol, one of the oldest English ports, is almost due east of Cardiff, on the opposite side of the Severn estuary. Bristol imports sugar, tobacco and cocoa from the West Indies and America. Its chief industries consist of the preparation of these articles for consumption. Fuel is obtained from the small Bristol coalfield.

London is the chief commercial centre in the world. This is largely due to its good geographical position. The city is on the horses of the Thames estuary. The flow of the tide in this estuary

The hundreds of thousands of people who work in the city live in the suburbs. London therefore requires good transport systems for passengers. Tramways serve part of London, and omnibuses go almost everywhere. But a great deal of passenger traffic is carried on underground, in the "tube" railways. These consist of rails laid in deep-level iron tubes, and traversed by electric trains. They carry about 4000 lakhs (40 crores) of people yearly.

The Central Valley contains practically all the mineral wealth of Scotland. Hence the great industries are carried on in this area. The busiest and most thickly peopled part is the basin of the Clyde. On the banks of the river, at the head of tidal navigation, stands the great city of Glasgow. This one city contains about a quarter of the population of Scotland.

Below Glasgow there are other towns on the Clyde estuary—Clydebank and Dumbarton on the right bank, Renfrew, Port Glasgow and Greenock on the left. All these are ports, and they are all engaged in shipbuilding, or in some industry connected with shipbuilding, such as steel-making and engineering. Fuel is obtained from the Clyde coalfield, but most of the iron ore is imported.

Other industries of the Clyde region are the manufacture of cotton, especially sewing-cotton, at Paisley, sugar-refining and the manufacture of chemicals and tobacco.

Crossing over to **Eastern Scotland**, we find more industrial towns in the basins of the Forth and the Tay. They obtain coal from the Forth basin coalfields. Dundee, on the Tay estuary, is the centre of the British jute industry, using raw material from India. Perth, at the head of the same estuary, specialises in dyeing, for which industry the water of the Tay is very suitable. Perth is also an important railway centre; it commands routes to the Highlands. Dunfermline, about 30 miles south of Perth, is famous for its manufactures of fine linen.

Edinburgh, the capital of Scotland, is near the south shore of the Forth estuary. The ancient city grew around a castle. This stands on a lofty crag, commanding the coast route from England. Edinburgh is more famous for its colleges than for its industries. It is also a great centre for tourists visiting Scotland. Leith, the chief port in the east of Scotland, is practically part of Edinburgh.

is very helpful to shipping. Docks and warehouses extend for miles along the riverside. In the docks are ships with produce from all parts of the world. London has a good position as a distributing centre. Roads and railways radiate from the city to all parts of Great Britain, and the port has good connections with the chief trading centres of Europe.

The trade attracted to this area has caused London to become an important financial centre. It has also made London the largest city in the world. Greater London has a population of 75 lakhs.

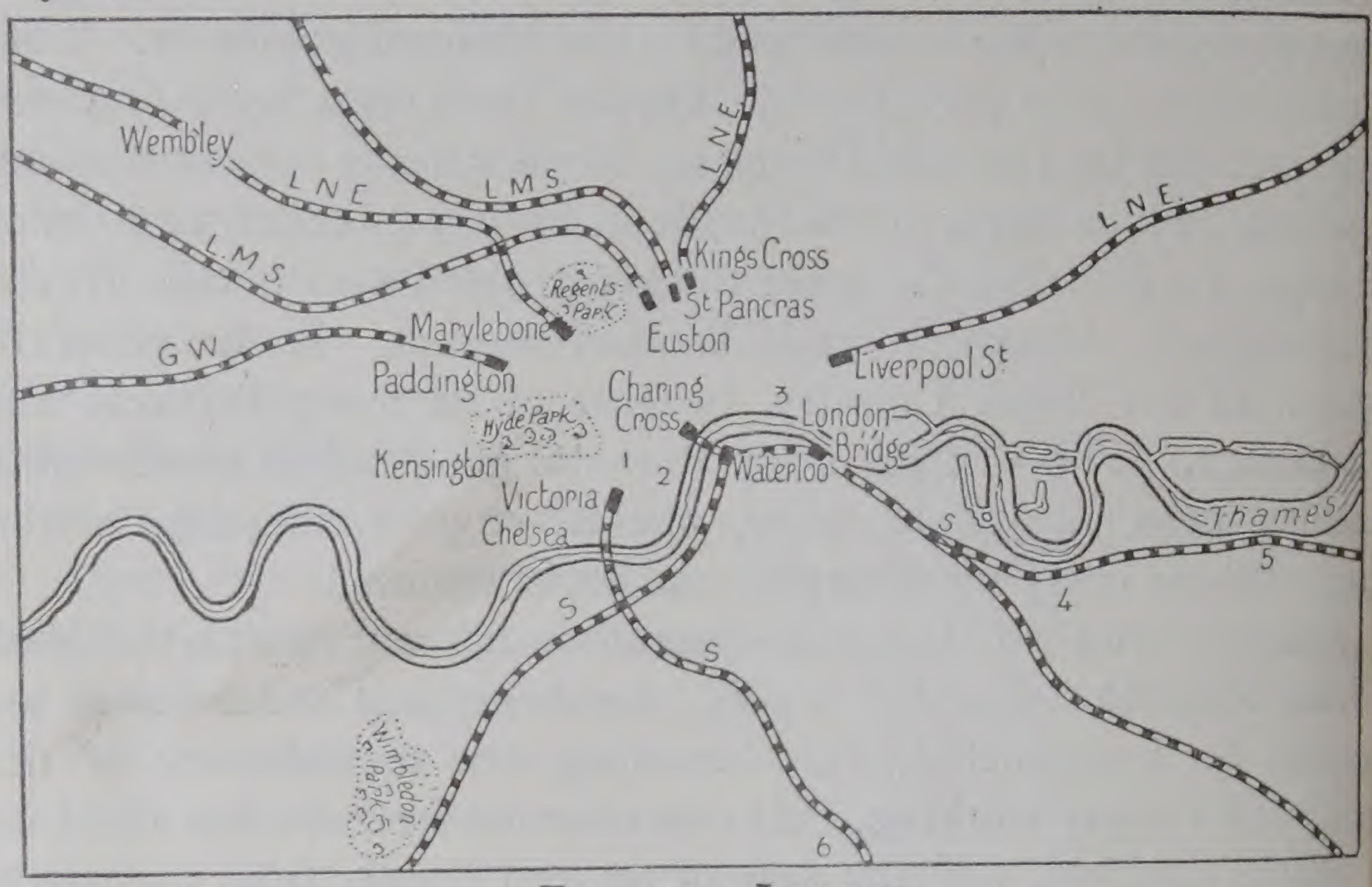


FIG. 140.—LONDON.

Old roads from places on the south-east coast led towards a place where the Thames could be crossed. Here was built a bridge which marked the head of navigation. London grew beside the bridge—the meeting-place of sea-routes and land-routes. Docks, some of which are marked, extend for miles below London Bridge. The diagram shows the position of the more important railway stations and well-known places. 1 = Buckingham Palace; 2 = Houses of Parliament; 3 = St. Paul's Cathedral; 4 = Greenwich (Park and Observatory); 5 = Woolwich; 6 = Crystal Palace.

The needs of this large population have led to the establishment o many industries, though coal and iron are not found near Londo Many people are engaged in the making of furniture, clothing, soap electrical and scientific apparatus, engines and chemicals. Printin is also an important industry; in the production of books and news papers London is one of the chief centres in the world.

Going southwards from Edinburgh we soon reach the Southern Uplands. Here sheep may be seen in thousands. Going farther, we reach the **valley of the Tweed.** Here, on the banks of the Tweed and its tributaries, we find Peebles, Innerleithen and Hawick. They are manufacturing towns, making " tweed " cloth and other goods from the wool produced on the hill farms.

Ireland cannot at present be described as an industrial country. One reason is that the country has very little coal. An important hydro-electric power scheme, now being carried out on the Shannon, may lead to the development of Irish industries. But one town, Belfast, has several large industries. The chief ones are ship-building, and the manufacture of linen and tobacco. Much flax is grown in the district near Belfast. Coal, and steel plates for shipbuilding are imported from the Clyde towns and the Cumberland coalfield.

Farming and Fisheries.

Farming. Though British people are so interested in manufactures and trade, agriculture and pastoral work receive careful attention in all parts of the country. British farmers are probably the best in the world. But the soil needs regular treatment with manures and fertilisers. In the farming districts, the towns are generally centres for the buying and selling of farm produce, and for the manufacture of machines used on farms.

Mixed farming is generally practised in Britain. That is, most farmers engage in both agriculture and pastoral work. They grow corn and root crops, and cultivate grass to be mown for hay. But they use part of their land for grazing cattle and sheep. Animal rearing is, however, more important on the higher ground, and crop raising in the valleys and plains. The hill pastures of Wales, the Pennines and Scotland are used mainly for sheep. These are a supply part of the raw material used in the woollen industry. In the rich fields of the plain are to be seen herds of cattle—some to supply milk and others meat for the town markets. Cheshire and the south-west of England are the chief dairy farming areas.

Wheat is grown on a large scale only in the east of Britain, where the climate is comparatively dry. The amount grown is less than a quarter of what the population requires. Oats, potatoes and root

crops are grown in all parts of the islands. Near London and other large towns there are many market gardens. From these, fruit, vegetables and flowers are sent into the towns daily. But very large quantities of garden produce are imported by London dealers, from France and other European countries.

Ireland is largely a farming country. The people are engaged in rearing cattle and pigs, and to a smaller extent in agriculture. Sheep rearing receives little attention except in the mountains of Donegal. Cattle are reared on the mountains of Kerry and in the valleys of both north and south of Ireland. Dairy farming is very important, especially in the valleys of the two mountain regions. Londonderry in the north, Cork, Waterford and Wexford in the south, export butter and condensed milk sent from the dairy farms. These towns also export bacon, cured in the factories of Cork, Limerick and other places. Agriculture is carried on to provide food for home consumption; the potato receives special attention. Flax is a special crop near Belfast.

FIG. 141.—IRELAND.

British fisheries are very important. They find employment for a large number of people; and they provide a large part of the people's food. Nearly every town along the coasts is a fishing port. Aberdeen, Hull, Grimsby, Yarmouth and Lowestoft, are specially important. They are near the famous Dogger Bank fishing ground in the North Sea.

BRITISH RAILWAYS

Britain has four great railway systems. These are the London and North Eastern, London Midland and Scottish, Great Western, and Southern. Main lines radiate from London to every part of the country. Steamboats make a connection between British railways and those of Ireland and Europe.

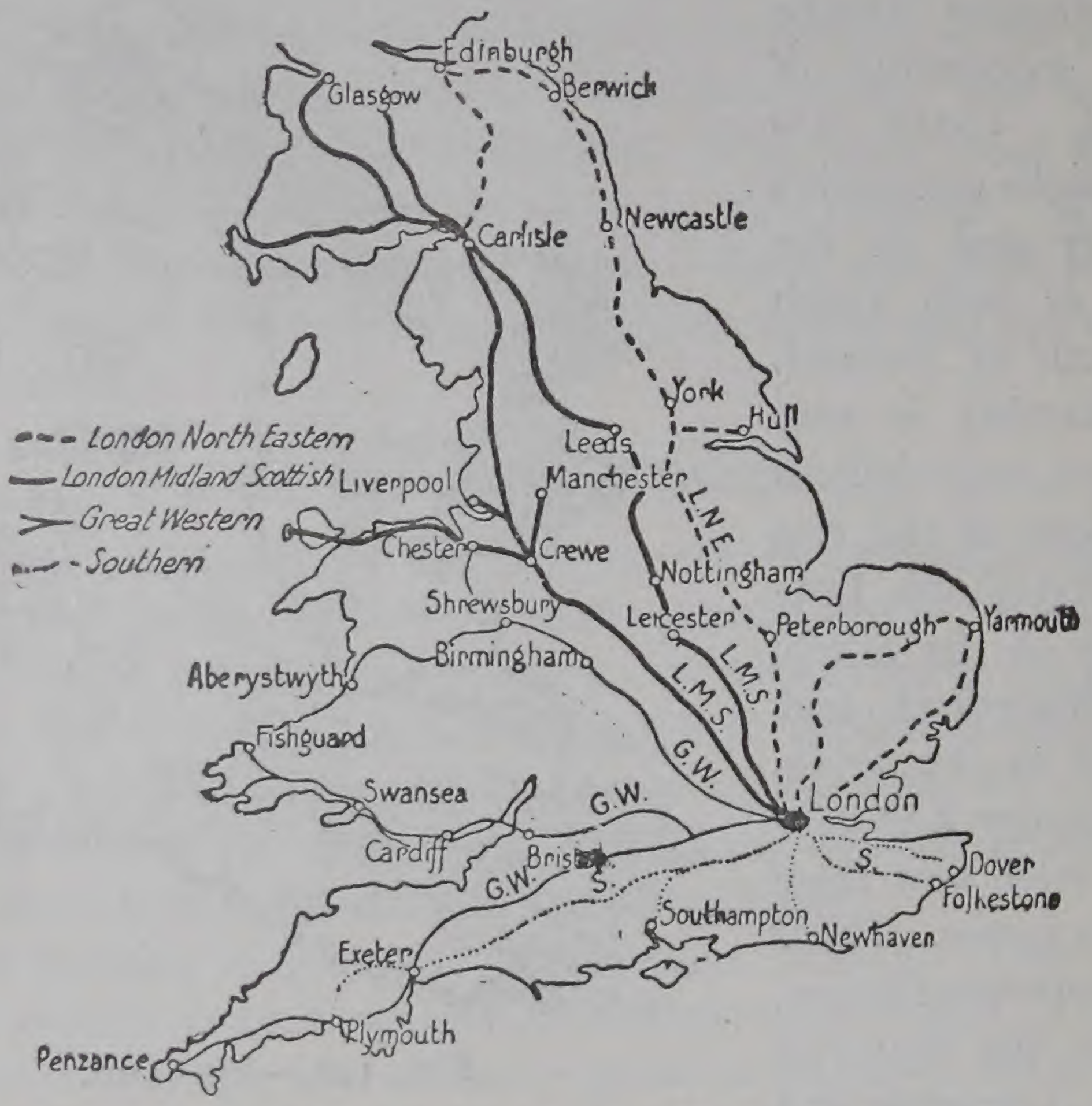


FIG. 142.—THE MAIN LINES OF THE FOUR BRITISH RAILWAY SYSTEMS.

The **London and North Eastern** (L.N.E.), as its name indicates, runs from the capital to north-eastern England, and then through the east of Scotland. This railway therefore links the important cities, Aberdeen, Edinburgh, Newcastle and York with London. The best train on this route is known as the "Flying Scotsman." Other L.N.E. branches run through the eastern counties of England. They connect the university town of Cambridge, Norwich and Yarmouth with the capital.

The **London Midland and Scottish** (L.M.S.) has two main lines from London to the north. One line runs to Sheffield, Leeds and Bradford on the Yorkshire coalfield. Then it passes through the Aire Gap in the Pennines, and goes over a western spur of the Pennines to Carlisle. Then it continues through the Southern Uplands to Glasgow, and to Edinburgh. The other L.M.S. main line (the "Royal Scot" route), connects London with the Black Country, the Pottery district and the Lancashire industrial region. The line then continues over Shap Fells to Carlisle, and makes a second link between Carlisle and Glasgow. The L.M.S. railway connects Glasgow with Inverness and then continues to the extreme north of Scotland.

The **Great Western** sends out three long arms from London. One goes through Birmingham and Shrewsbury to Chester. Another goes through Reading to Bristol and then by the Severn tunnel to South Wales, connecting Cardiff, Swansea and Fishguard with the capital. The third line goes through Exeter and Plymouth to Penzance, at the end of the south-west peninsula.

The **Southern railway** has lines to every place of importance on the south coast. Specially important lines are those which link London with Dover, Folkestone, Newhaven and Southampton. From these ports steamboats run to ports in France and Belgium. Southampton is also the terminal port for the Atlantic liners.

Dublin is the chief railway centre in Ireland. From this city lines run northward to Belfast and Londonderry, southward to Waterford and Cork, and across the country to Galway.

EXERCISES

1. In which parts of the British Isles are the cotton, woollen, jute, steel and shipbuilding industries carried on? Mark each area on an outline map, and insert the names of the chief towns.

2. Name the four railway systems of Britain. Make a diagram showing the course of the main lines, and the towns on each route.

3. Make sketches to show the situation of London and Liverpool. Mention some factors which have fostered the growth of these cities.

4. Name the chief crops grown in the British Isles, saying in which parts they are produced on a large scale.

XXX. ASIA—PART I

I. SURFACE RELIEF

Asia has three main physical divisions: (1) a vast plain in the north; (2) a huge highland region near the middle; (3) a region of peninsulas and islands with very varied surface in the south-east. The build of the continent is best understood by considering the highlands first.

The Highlands of Asia consist of two portions: (*a*) the plateaux of the south and south-west; (*b*) the central highlands—a complicated system of fold mountains and basin-shaped plateaux.

The southern plateau is the Deccan. It is triangular in shape, with its apex to the south, and separated from the other highlands by the plains of the Indus and the Ganges. The western edge of the Deccan, called the Western Ghats, is a bold escarpment facing the Arabian Sea, but separated from the coast by a narrow belt of low land. The escarpment has been dissected by rain and rivers, so there are natural routes from the west coast of India to the interior.

From the high western edge the Deccan slopes in an easterly direction to the Eastern Ghats. This edge of the plateau is much lower and more broken than the western edge. The long rivers of the Deccan flow to the Bay of Bengal. Those which descend the Western Ghats are short and swift.

The south-west plateau is divided into two parts by the trough which contains the Persian Gulf and the rivers Tigris and Euphrates. On one side of the trough lies the Arabian plateau. It stretches its lofty jagged edge along the whole of one side of the Red Sea; its general slope is towards the Persian Gulf and the plains of Mesopotamia. On the other side of the trough a huge plateau extends from the Sulaiman and Kirthar mountains to the shores of the Black and Mediterranean Seas. Different portions are known as the Iran, Kurdistan and Anatolian plateaux. The surface is very irregular. Salt lakes and salt deserts occur in many of its depressions, and large areas consist of salt steppe. Edges of this plateau are seen in the Pontic mountains beside the Black Sea, the Taurus range overlooking the Mediterranean, the Zagros mountains near the Persian

Gulf, the Elburz mountains bordering the Caspian, and the Sulaiman and Kirthar mountains which overlook the Indus.

The greatest fold mountains of Asia radiate from a central mountain knot called the Pamirs ("Roof of the World"). First let us trace the main water-parting. Starting in the Pamirs, we

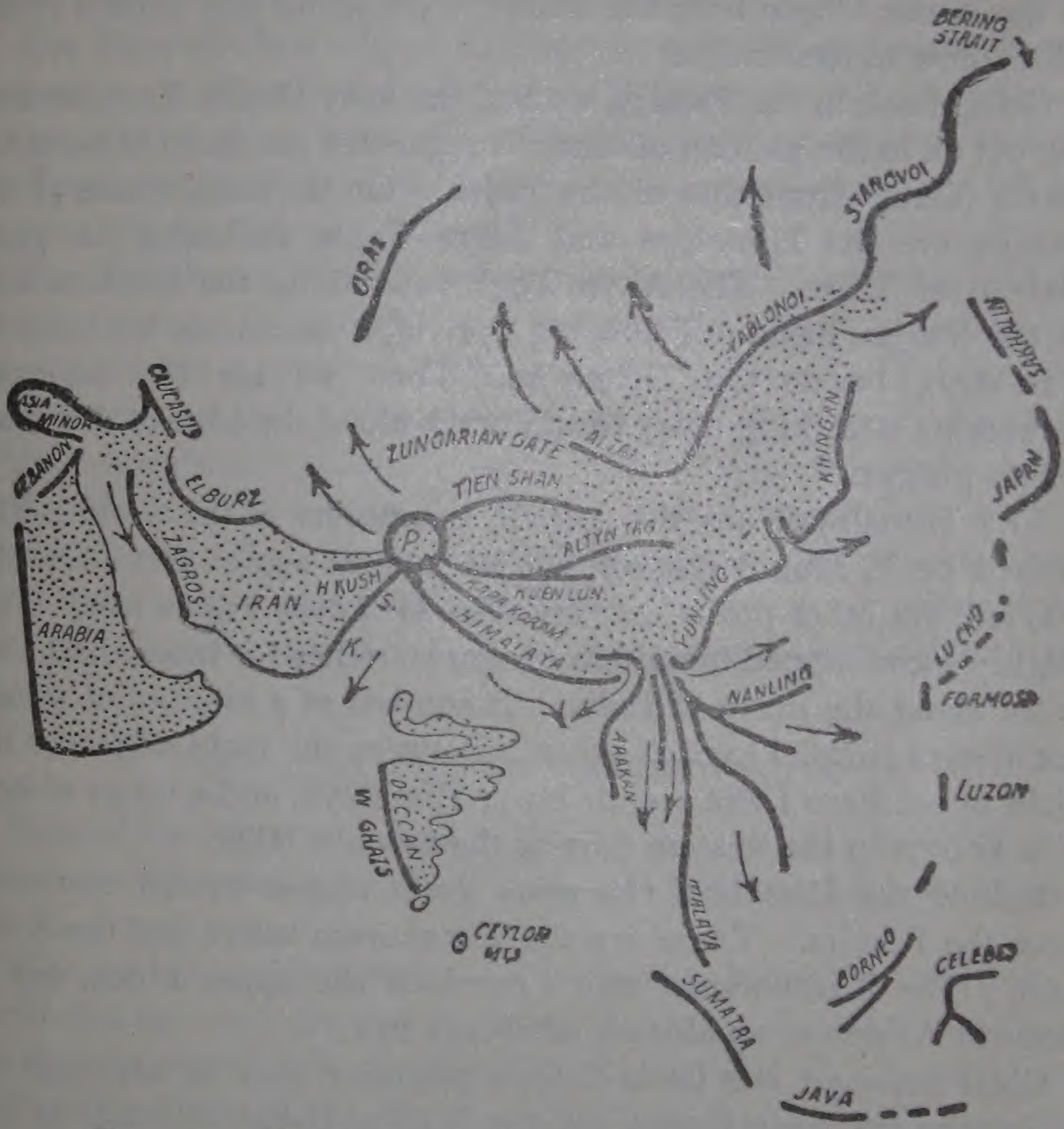


FIG. 143.—PLAN OF THE HIGHLANDS OF ASIA, AND THE SUBMERGED MOUNTAIN SYSTEMS REPRESENTED BY FESTOONS OF ISLANDS OFF THE EAST COAST.

Thick lines show the direction of the chief ridges. Dotted areas are plateaux. Name the rivers indicated by the arrows.

follow the watershed through the lofty Tien Shan. On one side is the high Tarim Basin; on the other are rivers that flow to the Aral Sea and Lake Balkash. Next come the Altai mountains; but between these and the Tien Shan there is a narrow gap known as

the **Zungarian Gate.** This is a natural route through the watershed from the Siberian plain to the Mongolian plateau. From the Altai the continental water-parting runs to the north-east corner of Asia through the Yablonoi and Stanovoi mountains. This portion separates the basins of the Ob, Yenisei and Lena, which flow to the Arctic Ocean from the basins of the Amur and smaller rivers which flow to the Pacific.

Going back to the Pamirs, we find the lofty Hindu Kush stretching out on to the plateau of Iran; it separates the basin of the Amu Daria (Oxus) from that of the Indus. On the eastern side of the Pamirs are the Himalaya and Altyn Tagh, enclosing the great plateau of Tibet. The Altyn Tagh runs along the southern side of the Tarim Basin. Following the ridge eastwards we come to Nan-shan, beside the Hoang-ho. Then we see the Khingan mountains stretching away to the north along the edge of the Mongolian plateau.

The Himalayas are the loftiest mountains in the world. The highest peak, Mount Everest, has its summit 29,002 feet above the sea, and six other peaks have an altitude of over 25,000 feet. This mighty snow-capped mountain system stretches for more than 1200 miles along the north of India. It consists of a number of ridges, not always parallel to each other. Between the main ridge and the plain of northern India are the lower Himalaya, and a range of foothills known in the western part as the Siwalik Hills.

Behind the Himalaya two more great ridges stretch eastwards from the Pamirs. These are the Karakoram range and the Kwen Lun. The Karakorams, which overlook the upper Indus, rise in Godwin Austen to an altitude of 28,250 feet.

Chief amongst the basin-shaped plateaux that lie amongst the mountains we have traced are the Tarim Basin (Sin-kiang) and Mongolia. Mountain streams flow down into these depressions; they do not reach the sea. They lose themselves in salt lakes or desert sands. Large portions of the basins are covered with shifting sand dunes called "barkhans."

From the east of Tibet several high ridges run south through Burma and Indo-China. The Patkoi range bends sharply round into Assam, throws off a spur called the Kasai and Garo Hills, and then runs parallel to the coast of Burma as the Arakan Yoma.

Behind this lies the Pegu Yoma, with an isolated extinct volcano, Mount Popa, near its northern extremity. Behind the Pegu Yoma again there is the Shan Plateau, from which a ridge runs southward through the Malay Peninsula. Another ridge is seen in Sumatra. It can be traced eastwards through Java and a long line of smaller islands.

The Eastern Islands of Asia appear to have been formed by the submergence of a mountain system. They are arranged in festoons which enclose five seas. The festoons are: (*a*) Borneo and the Philippines, (*b*) the Lu Chu Islands, (*c*) the Japanese group, (*d*) the Kuriles, (*e*) the Aleutian Islands.

The Northern Plain lies between the central highlands and the Arctic Ocean. It extends from the Caspian Sea to the Bering Strait, and has a general slope towards the north. Three large rivers, the Ob-Irtish, the Yenisei and the Lena flow across the plain. Their commercial value is greatly reduced because they enter an ocean which is little used for trade. The Caspian Sea lies in a depression 3000 feet deep. Its surface is 85 feet below ocean level. Seals in its waters, and marine fossils in the rocks around it, indicate that the Caspian and the Aral Sea were once connected with the ocean.

II. CLIMATE AND VEGETATION

Most of the huge land area of Asia is in the temperate zone. A narrow belt lies within the Arctic Circle, and three peninsulas project into the torrid zone.

There are many local variations in climate, but the continent may be divided into four climatic regions. These are the Northern Plain, the Central Highlands, the Monsoon Region and South-west Asia.

The Northern Plain slopes towards the Arctic; it is also shut off from warm southern influences by the mountains. Hence this region has a **very cold winter**; it contains the "cold pole" of the earth (see Fig. 147). The mouths of the Siberian rivers are ice-blocked for eight months of the year. Lake Baikal is frozen from December to April. **Summers are short but warm.** Verkhoyansk, the coldest inhabited place in the world, has an annual range of temperature of 118°. The average temperatures for January and July are −59° and 59° respectively. As the country is fairly level,

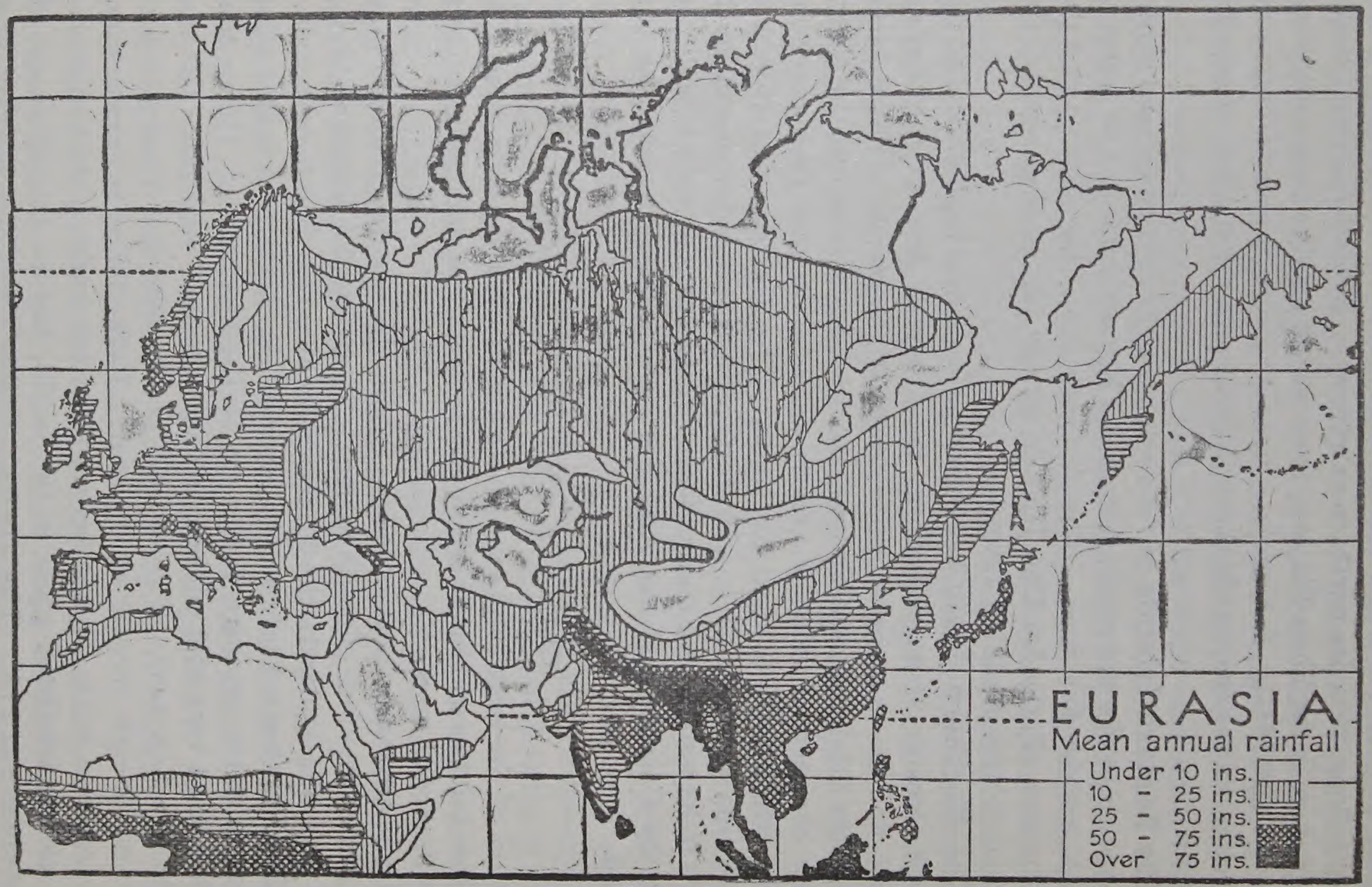

EURASIA
Mean annual rainfall
Under 10 ins.
10 - 25 ins.
25 - 50 ins.
50 - 75 ins.
Over 75 ins.

FIG. 144.

rainfall and snow are evenly distributed. But no part receives heavy rainfall (Fig. 144).

As regards vegetation, there are three belts in the northern plain—**tundras** in the north, **forests** in the centre, and **steppe** in the south where rainfall is low.

The Central Highlands. The climate of this region is governed by **distance from the sea**, and **altitude.**

FIG. 145.—MAJOR CLIMATIC REGIONS OF ASIA.

The climate is **extreme.** Winters are cold, summers are hot. The temperature of Kashgar ranges from 21° to 80°; that of Urga from −15° to 63°. Little rain falls anywhere in the highlands. The Tarim basin and the Gobi Desert are almost rainless and they bear little vegetation. Rain-bearing winds do manage to pass the Khingan mountains, and part of Mongolia is therefore steppe land. Urga has 7 inches of rainfall per year.

Most of Tibet has low rainfall. But in the east there are valleys

which allow the monsoons to blow into the country. These winds bring sufficient rain to support the growth of forests; and the people can grow wheat, millet and maize.

The Monsoon Region. The climate of Asia is greatly influenced by changes in atmospheric pressure in the interior. **Pressure is low in the hot season.** Winds blow round the "low" in counter-

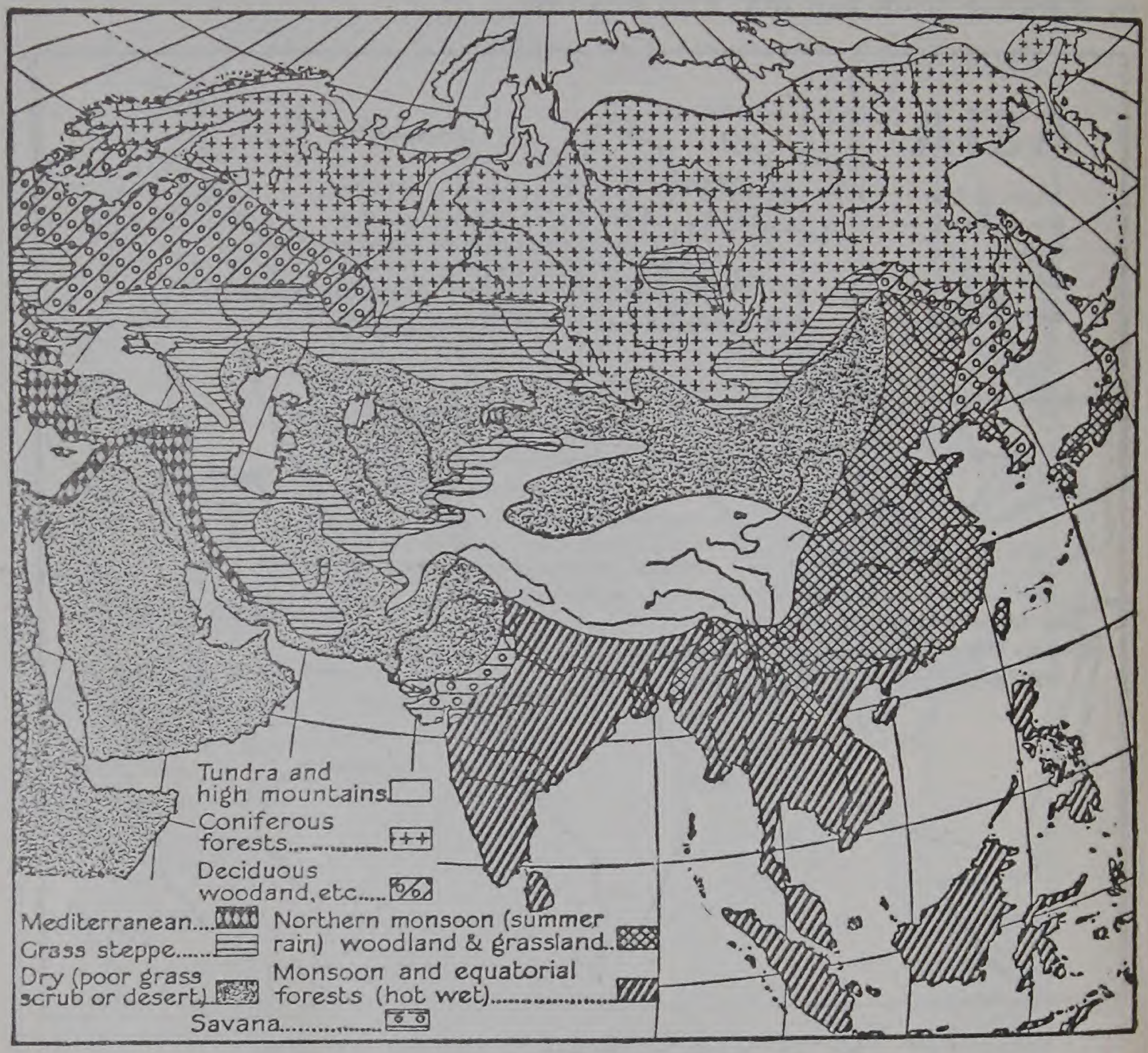


FIG. 146.—NATURAL VEGETATION OF ASIA.

clockwise direction (see page 42). India and Burma therefore receive moist south-west winds from the Indian Ocean; China and Japan receive moist winds from the Pacific.

Pressure is high in the cool season. The winds then blow in clockwise direction. Thus India receives dry north-east winds and China dry north-west winds. Siam and Annam also have a monsoon climate. All the monsoon lands have rich and varied vegetation.

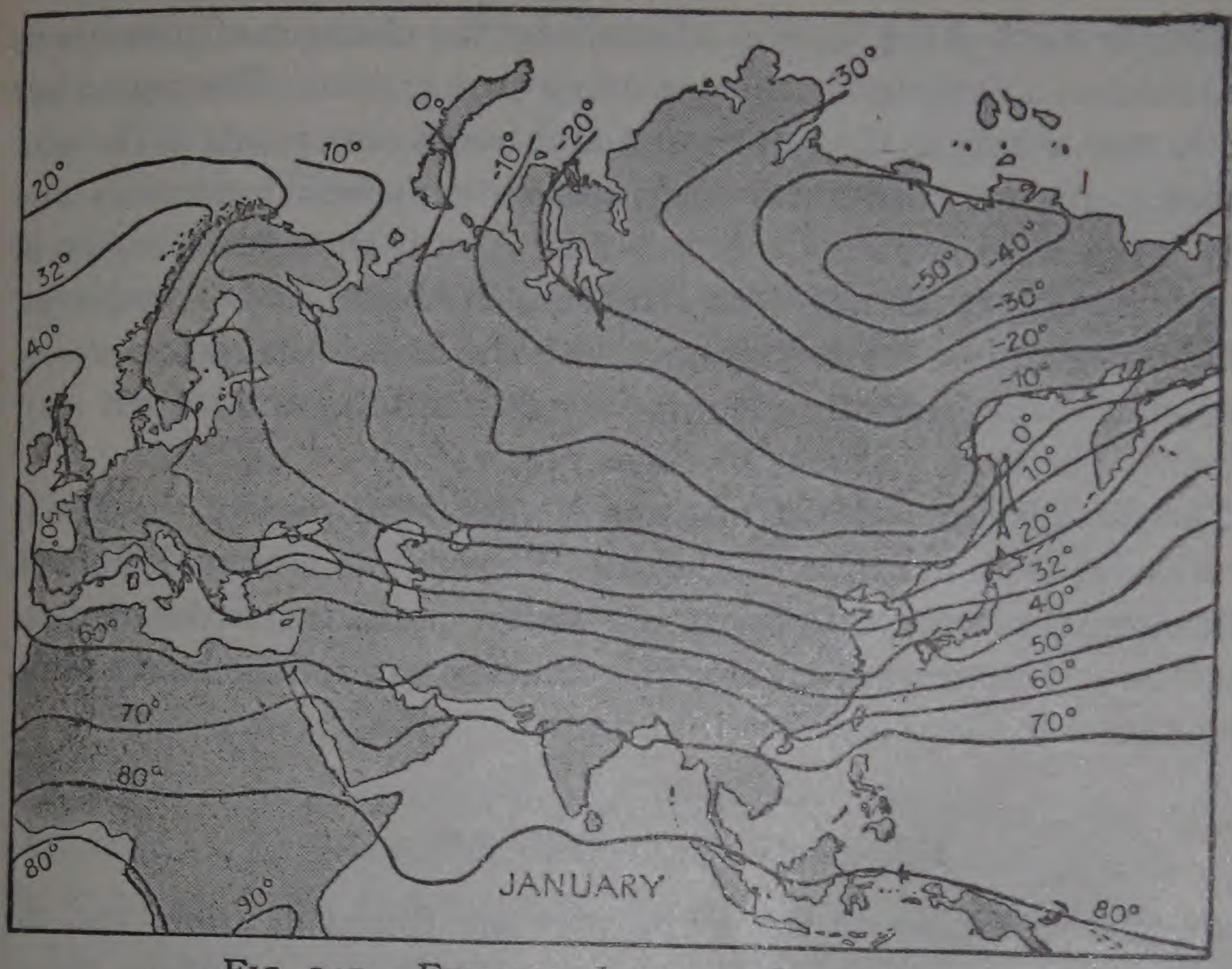


FIG. 147.—EURASIA, JANUARY ISOTHERMS.

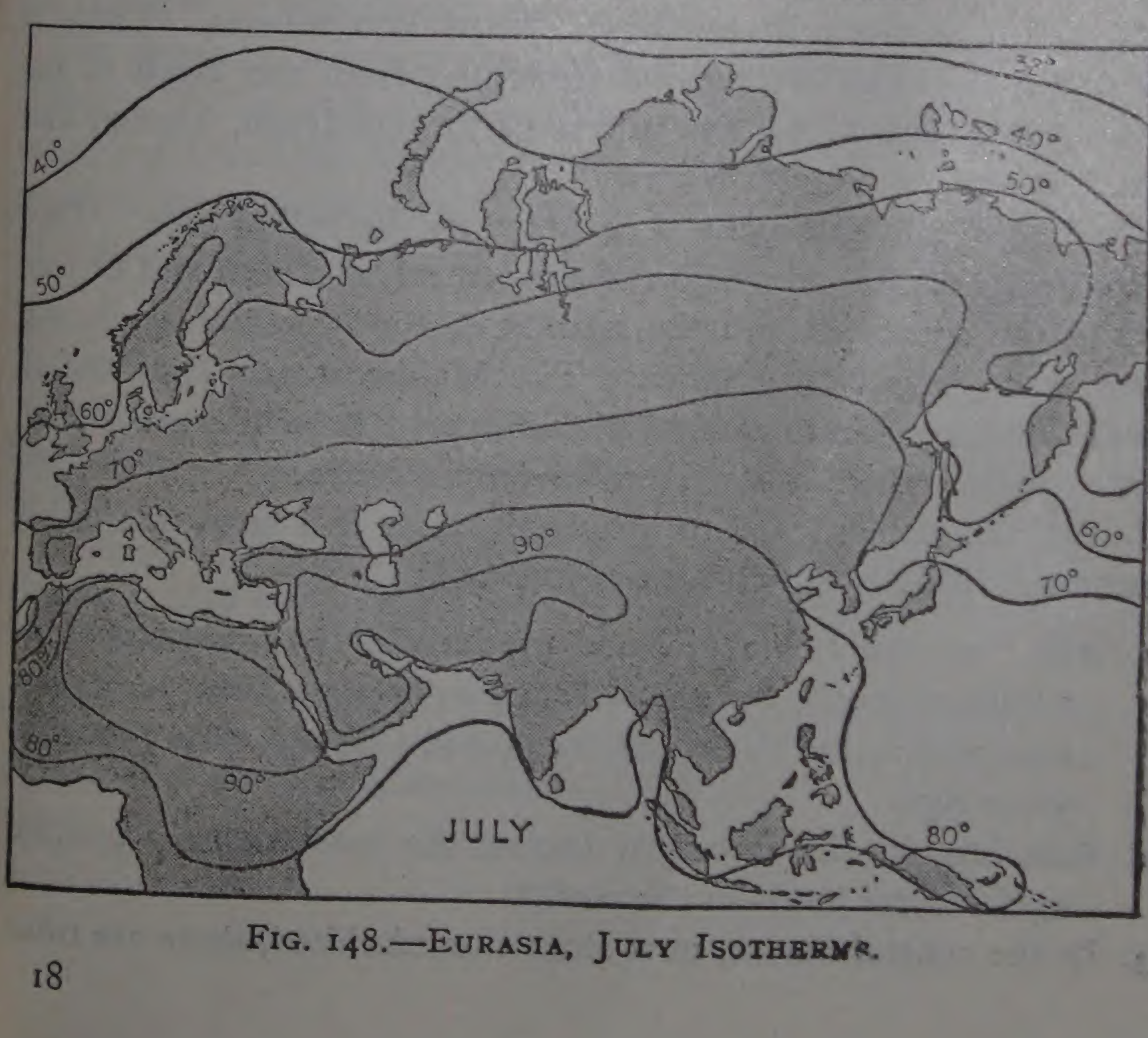


FIG. 148.—EURASIA, JULY ISOTHERMS.

South-west Asia is also affected by the changes of pressure in the interior, mentioned in the preceding paragraph. The region has north-west winds in the hot season and north-east winds in the cool season. In each season the winds come mainly from land areas, and they bring little moisture. South-west Asia is therefore a region of **steppe**, **scrubland** and **desert.** In Iraq, Bokhara, and other places, agriculture can be carried on only with the help of irrigation works. Baghdad and Tehran have 9 inches rainfall, and Aden only 2 inches per year. (Refer to Figs. 144, 146.)

The East Indies. Most of these islands, and part of the Malay Peninsula, lie in the equatorial belt. The climate is **equable but hot.** The annual range of temperature is not more than two or three degrees. Hot seas and mountains combine to produce **heavy rains.** Vegetation is therefore very luxuriant.

III. THE PEOPLES OF ASIA

People belonging to the white race are found in India and the plateaux of the south-west, except Asia Minor. During recent times, colonists from Russia have spread into Siberia. There is now a line of white settlements stretching from the Urals to the Pacific coast, and along the valleys of the Ob-Irtish, Yenisei and Lena.

The rest of the continent is occupied by the yellow race. Thus yellow people are in possession of the central, northern and eastern parts of the continent and the islands of the east and south-east shores, excepting New Guinea. The Malayans and East Indian islanders are sometimes classed as a distinct " brown " race. Most people consider them a division of the yellow race.

Considered with regard to its people, Asia is a most interesting continent. This is shown by the following :

1. Asia was the home of some of the oldest civilised peoples. Civilised people were established in Mesopotamia 7000 years ago, and in the valleys of India and China several thousand years ago.
2. Asia has, in the monsoon region, the most densely peopled agricultural lands in the world.
3. In the central basins, now almost uninhabited, there are ruins

of great cities. These areas must once have had a large population.

4. Asia has more nomadic tribes of people than any other continent. These tribes are found in the north, centre and south-west.
5. Asia has a larger percentage of its people engaged in agriculture than any other continent.
6. No other continent has so many old-established home industries.
7. Most, if not all, of the other continents were peopled from Asia.
8. Asia was the home of all the great religions of the world—Buddhism, Christianity, Confucianism, Hinduism and Mohammedanism.

Asia is a continent of primary producers. In the centre, north and south-west, pastoral work is a most important occupation. In the monsoon lands and the East Indies people are mainly engaged in agriculture or plantation work. Comparatively small numbers are engaged in mining and industries.

The nomadic tribes of the north include the Samoyede, Ostiak, Tungus, Yakut and other peoples. On the steppe-lands of the centre are found the Kirghiz tribes and nomads of Mongolia. The mode of life of these peoples was described in Chapter XIV. We have now to consider the life and work of the settled peoples of Asia.

EXERCISES

1. Draw a plan of the highlands of Asia. Insert and name the chief rivers. Write notes on the direction of the main water-parting of Asia.

2. Name and describe briefly the belts of vegetation between the Himalaya and the Arctic coast. Write notes on the mode of life of the people who live in each belt.

3. Give reasons for the change in direction of the winds in the monsoon region of Asia. Explain the great difference in the amount of rainfall in south-east and south-west Asia.

XXXI. ASIA—PART II

I. CHINA

China and its dependencies, Sin-kiang and Tibet, have together a population of over 400 millions. That is, nearly a quarter of the world's people is found in these lands. Kiangsu, in which Shanghai is situated, is the most densely peopled province.

FIG. 149.

China consists mainly of the basins of three large rivers, and a smaller one called the Paiho. The large rivers are the Hoang-ho (Yellow river), the Yangtse (Blue river) and the Si (West river).

The Hoang-ho and the Yangtse rise on opposite sides of a mountain ridge in Tibet. For several hundred miles they flow through country that is very rugged, very difficult to travel in, and very

thinly peopled. They then traverse a low plateau, which has an altitude of three to five thousand feet, and plunge through deep gorges into the plain of North China.

During the summer months the rivers are fed by the melting snows of Tibet and by the heavy monsoon rains. Their volume is greatly increased. In case of the Yangtse, two large lakes—Tung-ting and Poyang—act as regulators. Part of the river is led into Tung-ting by means of a canal.

The Hoang-ho, called "China's Sorrow," has no regulator. Sometimes the river bursts its banks ; it floods the country for miles ; it destroys hundreds of villages and drowns thousands of people. The river has changed its course a dozen times during the last 2000 years. Before the year 1852 it entered the Yellow Sea south of the Shantung peninsula. Since that time it has flowed into the Gulf of Chihli.

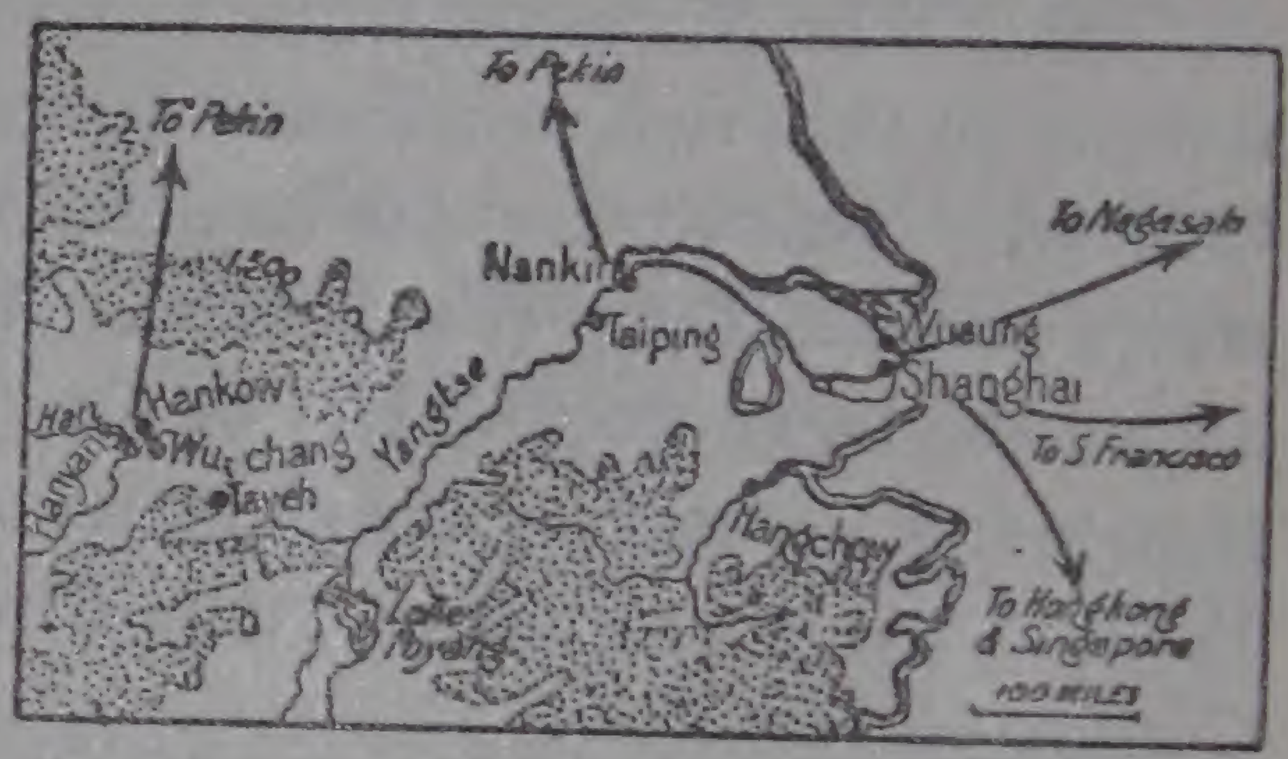


FIG. 150.—THE SITUATION OF SHANGHAI, NANKING, AND HANKOW.

Though the Hoang-ho has wrought so much havoc, it has *made* the northern plain, with the help of the Yangtse, as the Ganges has made the great plain in India. The deposit of sediment on the bed of the Hoang-ho has raised the river above the level of the adjacent land, thus increasing the danger of floods.

The Hoang-ho has a swift current, and it is almost useless for navigation. On the Yangtse vessels can go 1000 miles up the river to Ichang, where gorges and rapids begin. Small vessels can go through the Ichang gorges to Chun-king, 400 miles higher up. Beyond the gorges there is the Red Basin of Sechwan, named from its rich red soil. In this province the Yangtse is called the "River of Golden Sand" because of the gold dust in its bed.

The Yangtse is the principal highway for timber in China. Huge rafts of logs are floated slowly down from the western forests. On the rafts are huts, where people live for two or three months, whilst the timber is travelling towards the coast.

The chief tributary of the Yangtse is the Han. At its confluence with the Yangtse there are three towns—Hankow, Hanyang and

Wuchang. This triple town is one of the greatest river ports in the world, controlling traffic down-stream to Nanking and Shanghai, and upstream to Sechwan. This great trade centre is also connected by rail with Pekin, and it commands an important route past Lake Tung-ting to Canton. The Han valley forms yet another route to the north-west frontier of China. It would be difficult to say how many thousands of "bricks" and "tablets" of tea have been sent to Central Asia and Russia by this route. "Caravan tea," as it was called, once had a great reputation in Europe.

The Si-kiang basin is separated from that of the Yangtse by the Nan-ling mountains, into which its tributaries have cut many valleys. The Si comes from Yunnan, and is important as forming a route to that rich province. Its course lies very near the tropic of Cancer. Near the head of its delta, the Si is joined by the Pei (North river) and the Tung (East river). Where the three valleys meet has arisen the large trading city of Canton—a city with so many people that many thousands live in boats on the river. The valleys of the Pei and the Siang form a route through the middle of China, from Canton to Hankow.

LIFE AND WORK OF THE PEOPLE

The Chinese seem to have every natural advantage for becoming an industrial people. The merchants have good business qualities; the population could provide almost unlimited labour; the people are frugal and hard-working; the soil of the plains and valleys is very rich; the variation in climate from cold to tropical gives a wide range of crops; the country is exceptionally rich in minerals.

Coal exists in nearly all the eighteen provinces. It is said that the coalfields of Shansi could meet the world's needs for hundreds of years. The iron-ore region of Ta-yeh (in Hupeh) and the copper deposits of Yunnan and Sechwan are some of the best in the world. Yunnan has also valuable stores of tin. Other Chinese minerals are antimony, gold, silver, quicksilver, lead and petroleum.

Coal and iron have been worked in a small way for many centuries. But it is quite correct to say that the mineral wealth was practically untouched until recent times.

The Chinese are an agricultural people. The land is cultivated

very carefully, but with primitive implements. Crops vary according to climate and the character of the land. In summer almost the whole country is within the 80° isotherm. In winter, the 20° isotherm passes through the north, the 40° through the middle, and the 60° through the south of the country. Monsoon rains are general, and very heavy in the south. Winter is dry except in the coastal region.

These conditions determine the crops and other vegetation, which may be grouped thus :

North : birch, beech, oak, and willow trees ; wheat, barley, beans, and such fruits as the apple.

Centre : forest in the highlands of the west only ; rice, millet, maize, cotton, tea, mulberry.

South : All the crops grown in the central area, and in addition, sugar-cane, spices (ginger), oil-seeds, date-palm, bamboos, camphor laurel, and lacquer tree.

The basin of the Yangtse is particularly rich. Between Ichang and the sea, on both sides of the river, there are hundreds of cotton plantations, thousands of tea plantations, and tens of thousands of rice-fields. Even in the gorges every bit of land possible is cultivated ; villages are to be seen in clefts on each side. Sechwan has been called the " granary of China." It has a number of southward-facing valleys, in which there is very deep soil called " loess," deposited by winds The valleys are very suitable for the rearing of silkworms, and the province is as famous for silk production as it is for rice-growing. In addition, large tracts of land are used for growing tea and opium.

Tea plantations are most numerous in the hilly provinces of Fo-kien and Kiang-si. There is another large tea-growing area in the basin of the Si-kiang. The trade in China tea has declined through the development of tea-growing in India and Ceylon.

Pigs are reared in large numbers, and hens in millions. Eggs, egg-yolk and dried eggs are important articles of export. Apart from this, pastoral work has not received much attention in China. But some years ago the government established ranches for cattle and sheep near Kalgan and Pekin. Hides and wool are now exported—but much of the wool comes from Mongolia

Furs are much used in northern China. They are obtained mainly from Tibet and the mountainous province of Kansu. The chief towns engaged in the fur trade are Chengtu, capital of Sechwan, and Sian, capital of Shensi.

Chinese industries have just begun to develop. The manufacture of silk and cotton has been a home industry for many centuries. There are still thousands of looms in private dwellings. Competition has compelled the Chinese to adopt modern methods. There are sixty cotton mills in the country, at Shanghai, Ningpo, Hangchow and other places. They are equipped with up-to-date machinery.

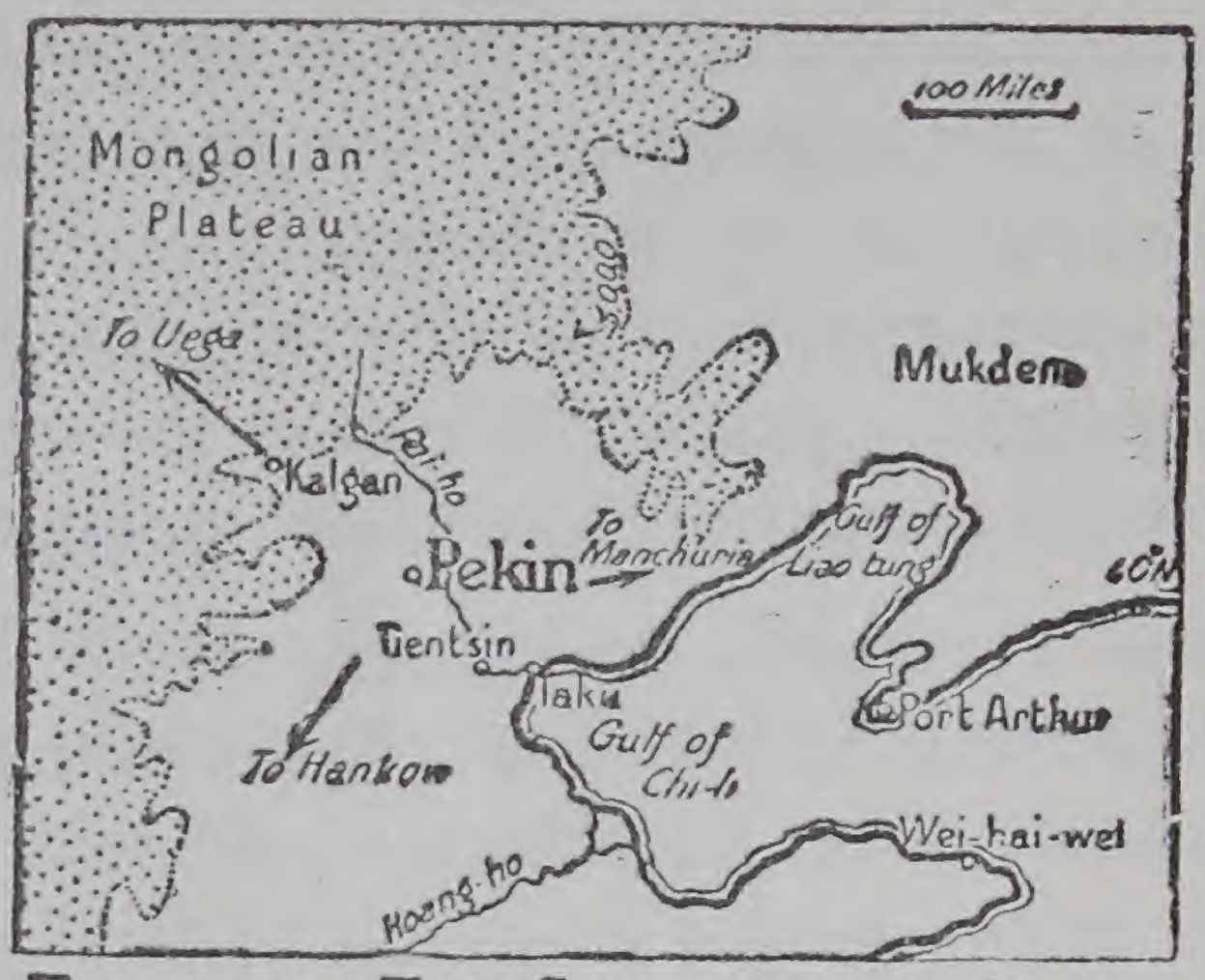


FIG. 151.—THE SITUATION OF PEKIN.

Shashi, on the Yangtse, is the centre of the chief cotton-weaving area. Silk is manufactured in many places, but especially in Hangchow, Nanking, and the Shantung peninsula.

The steel and engineering industries have made great progress. Large steelworks are in operation at Hanyang. Still larger works have been started near the iron mines of Ta-yeh. Shanghai has become an important shipbuilding and engineering town.

Means of communication are improving. Roads are generally very poor. The Yangtse is a most important highway for trade. Canals have been in use for many centuries. The Grand Canal, which connects Tientsin with Ning-po, was one of the greatest works of its kind in the world. But for many years it has been neglected.

The first permanent railway was opened in 1887. Now there are 6000 miles of railway and thousands more have been planned. The line from Hankow runs near the end of the Mongolian plateau to the capital, Pekin. This city is the focus

of many routes: (1) from Manchuria via Mukden, (2) from the sea via Ta-ku and Tientsin, (3) from Mongolia via Kalkan, (4) from Kashgar and Lhasa via the Hoang-ho valley. These facts explain why Pekin was made the capital by the Manchus.

The British Crown Colony of **Hong-Kong** consists of a number of islands at the mouth of the Si-kiang and a portion of the mainland—Kowloon. The colony has a population of half a million Chinese (60,000 of whom live on boats) and 14,000 Europeans.

FIG. 152.—SKETCH MAP SHOWING THE SITUATION OF HONG-KONG AND CANTON.

These ports command three valley routes. The Pei valley leads to the Hunan coalfield and to Hankow and Pekin. The Tung valley leads to the chief tea-growing area. The Si valley leads towards the province of Yunnan. Hong-Kong has the advantage of possessing, in Victoria Bay, a harbour for vessels that are too large to reach Canton. Hong-Kong is well placed for collecting merchandise from small ports along the coast.

The chief industries are shipbuilding, sugar-refining, tin-refining and rope-making. In addition, there are such native industries as cigarette-making, rattan-weaving and machine-knitting.

The capital, Victoria, extends for several miles along the shores of the finest harbour in the East. Much of the foreign trade of China passes through this port, for it is near three entrances to the country.

Sin-kiang is largely desert. Rivers flow from the melting ice of glaciers on the encircling rim of mountains. Thus portions of the country are irrigated. Some people are engaged in agriculture, raising grain and fruit on the irrigated land.

Many are pastoral nomads, living on the mountains in summer, and descending to the valleys in winter. The chief towns, Kashgar and Yarkand, trade by caravan with China. Jade has been sent to China for thousands of years. Ruins of cities have been found in the desert sands. These indicate that the region once had a large population.

Tibet, a lofty plateau crossed by still loftier snow-capped ridges, is reached by difficult passes. The people are engaged in pastoral work and agriculture. As we noted above, the southern valleys yield cereals and fruit. Tibetan animals include the yak and musk-deer. The latter is becoming scarce. The yak is valuable because it provides food, and hair for the manufacture of cloth. It is also a most useful beast of burden. Tibetans trade by yak caravan with China and India.

Mongolia was formerly part of the Chinese empire. Inner Mongolia now belongs to Japan and Outer Mongolia has joined the U.S.S.R. The country is a large basin-shaped plateau. The climate is extreme and dry. Urga, for example, has mean monthly temperatures ranging from $-15°$ in January to $63°$ in July; the annual rainfall is 7 inches.

Mongolia consists of the Gobi, and a broad encircling belt of scrub and steppe land. In Outer Mongolia, that is, the northern part, agriculture is unknown. Chinese influence has led to some agricultural work in Inner Mongolia. But practically all the Mongolians are engaged in pastoral work or trading. They rear cattle and sheep for the food and raw materials they provide. They rear camels and horses for use as beasts of burden. Some wool, hides, and skins are exported. The "towns" of Mongolia are trading centres on the caravan routes. The chief route leads from Kalgan, near the Great Wall of China, across the desert to Urga, and then to Kiakhta, near Lake Baikal. Urga and Kalgan are connected by a motor service; the journey occupies four days. Another important caravan route goes westwards to Uliassutai and Kobdo in the Altai mountains.

II. JAPAN

Off the east of Asia lie three festoons of islands. They are: (1) the Kuriles, a line of barren volcanic islands enclosing

the Sea of Okhotsk; (2) the Japan islands, the chief of which are Hokkaido, Hondo and Kiushiu; (3) the Luchu islands and Formosa. These islands, together with half of the island of Sakhalin, and the peninsula of Korea and Manchukuo form the empire of Japan.

A short distance east of Japan the bed of the ocean sinks to a depth of over five miles. The islands lie along the very edge of the continental shelf. Most likely they once formed a mountain range. The sinking of the shorelands let the sea into low-lying areas, making the mountain range a chain of islands.

The land is not yet in a settled condition. Japan has had many disastrous earthquakes. The worst in its history occurred in 1923.

FIG. 153.—SURFACE FEATURES AND CHIEF ROUTES OF SOUTHERN AND CENTRAL JAPAN.

A tidal wave and fire following the earthquake, destroyed Tokyo, Yokohama, and other places; but the rebuilding of the cities was commenced without delay.

Japan has a very irregular surface. Amongst the mountains are many volcanic peaks. Fujiyama, a well-shaped cone, rises from the plain south-west of Tokyo to an altitude of over 12,000 feet. It has not been in eruption for over 200 years. Forests of deciduous and coniferous trees spread over the mountain slopes to the shores of

the Pacific. Almost exactly half of the empire is covered with forest. Oaks, chestnuts and pines grow on the mountains, bamboo forests, plantations of wax trees and lacquer trees in Hondo and Kiushiu, and camphor trees in Formosa. This island is the world's chief source of supply for camphor.

A large portion of Japan is mountain land unfit for cultivation. But more than half of the people are engaged in **agriculture.** Most of the land is divided into small holdings. More than 50 per cent. of the cultivated land is used for growing rice, which is the staple food.

The chief food crops, rice, wheat, barley and soya beans, are grown wherever possible. The southern part of Japan has a climate that makes it possible to grow tobacco, cotton, fruits, sugar-cane and tea. Silk is an important Japanese product, and, as might be expected, mulberries are grown on a large scale.

The Japanese give special attention to the cultivation of flowers and ornamental trees. The cherry and the plum are grown chiefly for the sake of their blossoms. The chrysanthemum is cultivated almost everywhere. Landscape gardening is a branch of work in which Japanese excel. In this work they make use of dwarf trees. They make gardens in imitation of pine-clad hills, with bays and islands adorned with tiny forests. So much attention is given to agriculture that pastoral work is rather neglected. But the government has established cattle farms and poultry farms, and is encouraging the rearing of horses. Pastoral work is most important in Korea.

Industries and commerce have made remarkable progress. Fifty years ago Japanese exports were chiefly fans, lacquer, procelain and curios. Now the list includes silk and cotton goods, coal, porcelain, glassware, matches, sugar, copper, machinery, tea, toys and camphor.

The change is the result of education and the development of the resources of the country. Large numbers of Japanese were sent to Europe to study methods of manufacture. Japan then erected modern factories and became a trade competitor of European peoples.

There are **coalfields** in Hokkaido, Kiushiu and Korea. Nagasaki, in Kiushiu, has an export trade in coal. The **iron and steel** industry is carried on in both Hokkaido and Kiushiu. Much of

the ore used is brought from the Ta-yeh mines of China. Gold, silver, copper and iron are worked both in the islands and in Korea. Kaolin, found near Nagoya, is used in the porcelain industry of that city.

Textile work is concerned mainly with silk and cotton. The chief manufacturing towns are Osaka and Kyoto. There are 7000 **cotton mills**, and nearly 4000 **silk factories** in the country. No less than two million families in Japan are engaged in silk culture; and there are 400,000 more families in Korea doing the same work. In the factories, women workers are far more numerous than men.

As the interior is mountainous, most of the large towns of Japan are near the coast. **Fishing** is therefore an important occupation, and it provides a large portion of the diet of the people.

Tokyo, the capital, with a population of over two million, is on the shores of the Bay of Tokyo. The city has a small harbour, but the chief port is Yokohama, nearer the entrance to the bay. Nagasaki, near the rich Kiushiu coalfield, is one of the principal shipbuilding centres. Kyoto, the old capital, is now an industrial town. The city is near the foot of Lake Biwa, surrounded by hills thickly covered with plantations of tea shrubs. It is a city of temples and pagodas, narrow winding streets and landscape gardens. Not far away is the busy town of Osaka, and the port of Kobe, on the shores of the inland sea.

Manchukuo may be described as a land of farms and forests, though coal is mined near Mukden, and there are large steel works at Dairen. Twenty-two million acres of land are cultivated. Five million of these are used for growing soya beans. Wheat, millet, rice and beans are also grown. Fur-bearing animals are trapped in the forests. The exports of Manchuria are furs and soya products—beans, oil, and cake made from the beans. Mills for the extraction of soya-bean oil are at Dairen. The Trans-Siberian railway, now a double track railway, passes through Manchuria to Vladivostok. From Harbin a branch runs to Mukden, which has become an important railway centre. Lines from Mukden run (1) to Seoul in Korea, (2) through the Liao-tung peninsula to Dairen and Port Arthur,

(3) to Tientsin and Pekin. Dairen is the chief trading town in Manchuria. It has grown whilst Port Arthur has declined.

Formosa, which lies on the tropic of Cancer, has a hot wet climate well suited to the growth of the camphor laurel, rice, jute, and sugar-cane. The production of camphor and of opium are government monopolies. When the island was ceded to Japan in 1895 the northern part was occupied by savage head-hunters. These people were very troublesome at first, but most of them now recognise Japanese authority.

III. SOUTH-EAST ASIA AND THE EAST INDIES

South-east Asia consists of two peninsulas, separated by the Gulf of Siam. The broad peninsula contains the kingdom of Siam and French Indo-China. The Malay Peninsula contains a number of small states known as British Malaya. Most of the East Indian islands, and the west half of New Guinea, belong to Holland; but Britain owns the north-west of Borneo. The Philippines belong to the United States, by whom they were granted provisional independence in 1934. After ten years the islands become independent.

As these peninsulas and islands lie between the tropic of Cancer and parallel 10° S., the climate is hot at all seasons, and rainfall is heavy. These conditions are particularly suitable for plantation work, and this engages the attention of a large portion of the population. The region may be described as one of **teak forests, plantations** and **rice-fields.**

Siam is a country with undulating surface, with large **forests** on the high lands. The richest and most densely peopled part of the country is the **alluvial plain** of the Menam. The plain produces much more **rice** than the people require. One million tons are exported yearly from Bangkok. This town is the capital and chief commercial centre; but the mouth of the river is obstructed by a bar. Teak and tin are also exported from Siam. Elephants, horses and buffaloes are largely used as beasts of burden. But there is a railway from Bangkok, up the valley of the Menam, to the town of Lukon.

The people of **French Indo-China** are engaged in agriculture and plantation work. The wide plain and delta of the Mekong yield large quantities of rice, sugar, cotton and spices. The country

comes second to Burma as exporter of rice. Saigon, near the Mekong, and Haiphong, near the Chinese frontier, are the chief trading centres.

British Malaya includes the broad part of the Malay Peninsula, and Singapore and Penang islands. Singapore, the capital and chief port, is joined to the mainland by the Johore Causeway. It has rail connection with Bangkok.

A hundred years ago Singapore island was a dense jungle with a small fishing village. The town has now a population of nearly half a million—and there are people from every continent to be seen in its streets.

About half of the world's supply of tin comes from Malaya, but the country owes its prosperity largely to the rubber trade. The demand for rubber in connection with the motor industry has caused plantations to be made in all parts of Malaya. Towns have come into existence; population has increased enormously. Plantation rubber comes mainly from Port Swettenham, Singapore and Penang.

A century ago the land was peopled by Malays. They lived in fishing villages and grew rice, coconuts and fruits in clearings of the jungle. Then came Chinese traders, who discovered that the land possessed stores of tin. They formed settlements, introduced the pine-apple, tapioca and other plants. *Now*, landing at Singapore or Penang is like going into China; the Malays are in the interior. Chinese control most of the undertakings—the tin workings, rice mills, rubber plantations, basket factories, steamship lines, hotels and banks.

Large numbers of people from India and Ceylon are found in Malaya. Some work on rubber plantations, others are employed in "Bombay shops." Educated Indians are commonly seen in government offices, post offices and on the railways.

Singapore is at the "cross-roads of the East." It is the focus of sea routes from China, Japan, India, Australia, and East Indian islands. It is therefore an important coaling port and a naval station. The port is a collecting centre for the produce of the islands and peninsula—tin, rubber, copra, fruits, spices, etc.

The Dutch East Indies. The equator passes through Sumatra, Borneo and Celebes, whilst Java and the other Dutch possessions

lie within a few degrees of it. These islands are therefore very similar to Malaya as regards both climate and productions.

Java is about twice as large as Ceylon, but its population is eight times as great. Java is the most densely peopled area in the world.

The inhabitants of the East Indies are almost wholly engaged in agriculture and plantation work. Sago, rice and tapioca are important foods of the islanders. The kind of work they do is indicated by the list of exports from Java—coffee, tea, cocoa, indigo, spices, cinchona, tobacco, rubber, copra, tin, petroleum and coal.

FIG. 154.

Singapore, on an island at the southern end of the Malay Peninsula, has become a great port because it is the focus of many sea-routes, and a collecting centre for the produce of the East Indies.

This shows that a few people are engaged in mining. Similar work is carried on in the other islands.

The Moluccas have a special trade in nutmegs and cloves. British North Borneo produces tobacco of high quality and exports large numbers of edible birds' nests to China.

The Philippines. The greater portion of the population of these islands is found in Luzon. This is the only island of commercial importance. The chief commercial products are Manila hemp (named after the chief town and port), sugar, tobacco and copra.

IV. SOUTH-WEST ASIA

South-west Asia contains a remarkable depression. In that depression lie the Persian Gulf and the Plains of Mesopotamia. On each side the land rises into huge plateaux—Iran, Kurdistan and Anatolia on one side, Arabia on the other.

South-west Asia is distinguished by altitude, extreme climate, low rainfall, a large number of rivers which never reach the sea, and a large area of desert. Mesopotamia and the western end of Anatolia (Asia Minor) are the only portions that are well watered.

Agriculture can be carried on only in oases and those parts where rivers provide water for irrigation. Hence south-west Asia is peopled largely by nomadic and semi-nomadic peoples. The date-palm grows well in irrigated land, and the date is an important food amongst both settled and nomadic peoples.

Afghanistan is the north-eastern portion of the plateau of Iran. Its surface is very rugged. The Hindu Kush extends from the north-east corner towards the middle of the country. Its glaciers furnish water for rivers which flow into swampy lakes or lose themselves in the desert. The Murghab goes northwards, carrying water that irrigates the country round Merv. The Hari Rud goes first to the west, making the land fruitful round the town of Herat. Then it flows along the western boundary, and is lost in the dry north. The Helmand and other streams flow to the south-west. They pass through rock-strewn valleys, between bare ridges, and lose themselves in the great Seistan swamp in the south-west of the country.

The stony uplands bear grass suitable for grazing purposes. There are to be seen groups of nomads with flocks of flat-tailed sheep that provide valuable food, and goats, asses and camels. The contrast between these areas and some of the valleys is very striking. Kabul, the capital, is surrounded by gardens. The annual rainfall is only 11 inches, but the Afghans are first-class irrigators, and they have made good use of the Kabul river. They grow wheat, barley, rice, maize, tobacco, and large quantities of grapes, figs, peaches, mulberries and other fruit. Some of these fruits, as well as gum, silk, carpets and wool, are sent down the Khyber Pass to Peshawar.

Persia stretches from the Afghan frontier to the Persian Gulf, and round the south end of the Caspian Sea. The edges of the plateau are the Elburz mountains beside the Caspian, and the Zagros range in the south-west ; these are clothed with forest. But the high rim of the plateau makes the interior dry ; it also obstructs communication with the interior.

The climate generally is dry and extreme. Tehran, the capital, has monthly temperatures ranging from 33° to 85°, and its annual rainfall is only 9 inches. The eastern half of the country consists of desert, scrub and steppe. The desert is 800 miles long.

Conditions in Persia are similar to those of Afghanistan. Many people are nomads. Where there are rivers from melting mountain snows the land is irrigated to grow fruit and grain. One of the most productive regions is the narrow plain beside the Caspian Sea. It yields good crops of wheat, barley, rice, grapes and other fruit, and it has been found very suitable for rearing silk-worms.

Persia is famous for its beautiful carpets, made at Tabriz, Kerman and other places. The workers use hair and wool supplied by the flocks and herds of the nomads, and silk from the Caspian region. A certain amount of raw silk is exported.

Most of the Persian trade is carried on by caravan—mainly mule-caravan. Ispahan is at the meeting place of several trade routes. One goes south through Shiraz and the rugged Bakhtiari mountains to Bushire. A second route leads through the same mountains to Ahwaz on the river Karun. A third route goes northward to Tehran. Tehran itself is a focus of trade routes leading east and west, and through the Elburz mountains to the Caspian shores. Tehran has also the advantage of a motor service to Damascus and Beirut.

Ahwaz has become important as the centre of an oilfield worked by the Anglo-Persian Oil Company. Petroleum is sent to Abadan, an oil-refining port on the Shat-el-Arab, to be shipped in oil-tankers to England. Abadan owes its growth entirely to the oil industry.

Armenia, Georgia and Azerbaijan. Persia extends north-west as far as Mount Ararat. But the rugged plateau stretches beyond this point. The valley of the Kur separates the plateau from the huge forested Caucasus range. In this region there are three

FIG. 155.—SOUTH-WEST ASIA.

The lightly dotted area is land over 1,500 feet, the heavily dotted area land over 6,000 feet.

republics: Armenia and the two Caucasus states, Georgia and Azerbaijan. All three belong to the Russian Union.

The valleys of the Caucasus states are overspread with cornfields, vineyards, cotton plantations and tobacco plantations. But the people employ primitive methods. Georgia has very rich deposits of manganese, but they are not fully worked. Azerbaijan possesses an important oilfield. Baku is the chief centre of this area. It is connected with Batum on the Black Sea by a pipe-line. But the chief town in the Caucasus region is Tiflis. It stands in the Kur valley, just where the one route through the Caucasus, Dariel Gorge, opens out into the valley.

Pastoral work and agriculture find employment for many people in Armenia, but many more are engaged in trade. The chief towns, Erivan, Erzerum, Trebizond, have grown by trading. Erzerum is a focus of trade routes. For thousands of years caravans have wound their way over the plateau to Armenia, from India, Central Asia, Russia, Anatolia, Syria, and Mesopotamia. Erzerum and Trebizond are not so important as they once were, but steamships and railways have not yet robbed them of their trade.

Turkey consists of the plateau of Anatolia and a small tract of land on the European side of the Bosporus. The lofty edges of the Anatolian plateau—Pontine mountains in the north and Taurus in the south—receive moderate rainfall. The interior is a rain-shadow region; and it has hot summers and very cold winters. Thus whilst the Pontine and Taurus mountains are clothed with fine forests of oak and fir, the interior is almost treeless. A large portion of the plateau consists of salt steppe.

From this it follows that there are two main occupations in Turkey. They are agriculture and pastoral work. Agriculture is carried on in the beautiful western valleys, in the islands near the coast, and in the Cilician plain near the south coast. Wheat, rice, cotton, tobacco and sub-tropical fruits are grown. Some of the islanders are engaged in sponge-fishing. Surplus products of these areas, especially figs, tobacco and sponges are exported through Smyrna.

On the plateau, cereals and fruit are grown in the warmer valleys. North-west of Konia the opium poppy is grown on a large scale. Generally, however, the plateau people are engaged in rearing sheep

and goats. Wool and hair are exported, but much of this material is used by the peasants in their cottage industries. They manufacture cloth, rugs, mats and leather. Angora, the capital, is a trading centre on the plateau.

The chief railway runs from Scutari to Konia. Then it goes through a pass in the Tauras mountains called the Cilician Gates, and round the north-east end of the Mediterranean to

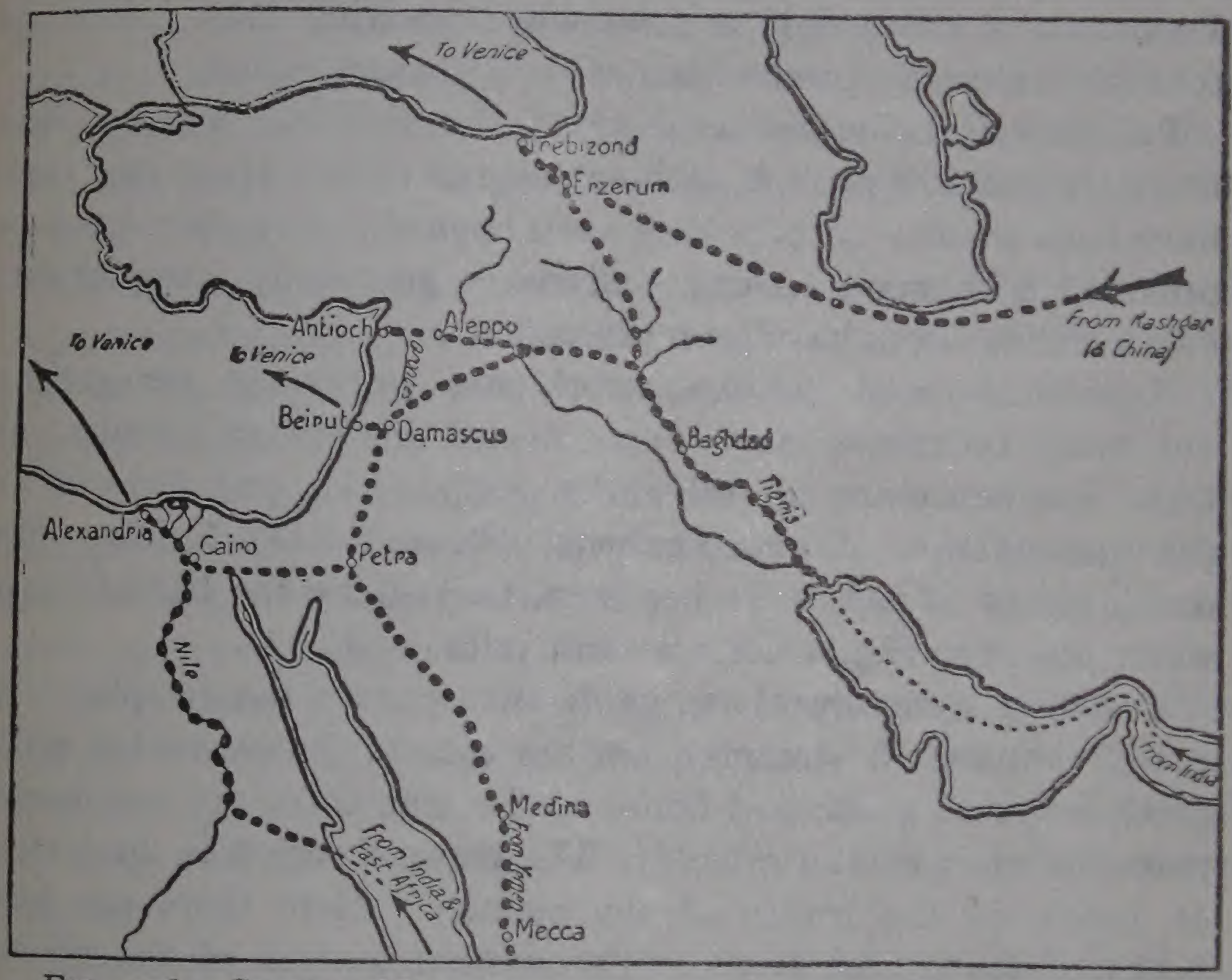


FIG. 156.—SKETCH MAP SHOWING SOME ANCIENT CARAVAN ROUTES THROUGH SOUTH-WEST ASIA TO THE BLACK AND MEDITERRANEAN SEAS.

These routes were most important in the days when Venice was the chief trade centre in Europe. Some are still in use ; others now have to face railway and motor competition.

Aleppo, in Syria. Aleppo is an important railway junction. One line goes east into Iraq. Another goes south through Damascus, and is continued as the " Pilgrims' Railway " to Medina.

Syria, an independent state, bound by a treaty of perpetual friendship to France and Palestine, under British mandate, close in the eastern end of the Mediterranean.

The French have made first-class roads in Syria, and they are used by thousands of motor-cars. A motor mail service connects

the chief port Beirut with Baghdad, the capital of Iraq. Beirut is also connected with the ancient city of Damascus by road and railway through the Lebanon mountains. (Refer to Fig. 61.)

The people are engaged mainly in agriculture, and, to a smaller extent, in pastoral work. Irrigation is necessary in the dry east, which is shut off from the sea by the Lebanon range. Olives, grapes, oranges and mulberries are largely cultivated. The oasis in which Damascus is situated is a good wheat-growing area. Silk and tobacco are special productions of the Lebanon region.

Palestine is being modernised by the British. Swamps have been drained and planted with eucalyptus trees. Many new roads have been made; schools have been opened; Jerusalem has been provided with good water; malaria is practically stamped out; half a million trees have been planted.

Agriculture and pastoral work are important occupations, but many industries have been started in Jewish colonies. In these colonies there are **oil-works**, soap-works, and factories for the manufacture of **glass, carpets**, silk and other articles. The development of industries has been assisted by the harnessing of water power at Haifa, Tiberias and Jaffa.

The best **agricultural region** is the western coastal plain. It is well watered by streams from the hills of Judea, and it yields good crops of grain and fruit. Jaffa and Gaza are well-known ports for oranges and grapes. The **pastoral region** is the plateau of Judea, in the centre of the country. Here there are large flocks of sheep and goats. The eastern margin of the plateau descends steeply to the Great Rift Valley, in which lie the river Jordan and the Dead Sea. The Dead Sea is 1300 feet below the level of the Mediterranean, and the land around it is very desolate. Beyond the Dead Sea lies the region called **Transjordania**. It is an Arab state without definite boundaries, under the care of the government of Palestine. The Hejaz railway passes through this region, but the land is mainly desert.

Arabia is a desert plateau. Its area is two-thirds that of India, but its population is sixty times less. The only portions that have moderate rainfall are Yemen in the south-west, and Oman in the south-east. The country is occupied largely by Bedouin Arabs. These are nomadic people, with their headquarters in oases. The

date-palm provides a large portion of their diet and their most valuable possessions are horses and camels.

Life is different in some of the **coastal areas.** Hejaz, Asir and Yemen, bordering the Red Sea, have fertile valleys that produce grain, coffee and dates. Mokha was once a coffee port, but Hodeida is now a busier port. Mecca, the largest city, is visited by many thousands of pilgrims. Some travel by the Pilgrims' Railway as far as Medina. Others come by sea to Jidda, which is connected with Mecca by a service of Ford motors. Agriculture is also carried on in Kuweit and Oman, near the Persian Gulf. Muscat is a date port, and Kuweit exports pearls (from the Gulf fisheries) as well as horses, wool and dates.

The kingdom of **Iraq** is more fortunate than most of the countries in south-west Asia. It is watered by two large rivers, the Euphrates and the Tigris. These unite to form the Shat-el-Arab, which flows into the Persian Gulf.

The **northern part** of Iraq is undulating grassland and steppe, interspersed with low stony hills. Rains in winter and spring enable crops to be grown without the aid of irrigation, but the people are more concerned with pastoral work than with agriculture.

The **southern part** is a low-lying plain composed of alluvium. The soil is very rich, but crops cannot be raised without irrigation, because rainfall is very low. Baghdad has only 9 inches of rainfall per year, and more than half of this falls between December and February.

Agriculture and pastoral work are the chief occupations of the settled portion of the population. Wheat, barley, millet and rice are grown in the plain, and tobacco on the hill-sides. A small amount of cotton is also grown. As more land is brought under irrigation this crop may become quite important. The date-palm receives special attention near the Shat-el-Arab. The two banks of this river are so well planted that the region looks like one vast palm-grove. Dates form an important article of diet, and large quantities are packed at Basra and exported.

Pastoral work is carried on in the hills, especially north of Baghdad, and in those parts of the plain not reached by irrigation works. Sheep are particularly numerous. The annual production of wool is about nine million pounds.

Industries such as silk spinning, weaving, and leather making, are carried on to supply the home market only. But the petroleum industry, controlled by the Anglo-Persian Company has developed greatly. The Shat-el-Arab is navigable by ocean vessels to Basra. Oil-tankers are always to be seen in this stretch of the river.

Basra is connected by railway with Baghdad. Another line runs from Baghdad almost to Mosul, which is the chief town in the northern pastoral region. It is a trading centre on the Tigris, reached by small boats.

Baghdad is a focus of trade routes. Airways connect the city with Cairo and Basra. Waterways afford communication to north and south. Caravan routes radiate from Baghdad towards the Mediterranean, Black and Caspian Seas and the Persian Gulf, and there is a regular motor service between Baghdad, Damascus and Beirut. Baghdad was a great city a thousand years ago. For centuries it has been declining. Revival is now taking place, and Baghdad may regain some of its former importance.

V. THE NORTHERN PLAIN

The great plain of Asia extends from the Arctic Ocean to the borders of Persia and Afghanistan. It contains a number of republics which belong to the Russian Union mentioned on page 246. The plain consists of two portions (*a*) Siberia, drained by the Ob-Irtish, Yenisei, Lena and some smaller streams, (*b*) Turan, the region between the Caspian and the Tien Shan.

Siberia has three belts—tundras next to the Arctic Ocean, a large forested region south of the tundras, and grassland south of the forests. The tundras and forests are thinly peopled by Samoyedes, Ostiaks, Yakuts and other nomadic tribes. Their mode of life was described in Chapter XIV. We are now concerned with the portion occupied by settled people.

The **southern belt** is the most important part of Siberia. It is a tract of land, 50 to 100 miles wide, traversed by the Siberian railway. All the important towns of Siberia—Omsk, Tomsk, Krasnoyarsk, Irkutsk—are within the belt. It is really a line of colonies, formed by settlers from Russia during the last hundred years. Farming is the chief occupation.

SIBERIA
Scale of Miles
200 0 400 800 1200
Forest
Railways
Murmansk
Archangel
Petrograd
Moscow
Perm
Kazan
Yekaterinburg
Obdorsk
Berezof
R. Ob
R. Yenisei
Tobolsk
Tomsk
Krasnoyarsk
Barnaul
Irkutsk
Semipalatinsk
Turgai
Aral Sea
L. Balkash
Khiva
Tashkent
Vyernoi
Issik-Kul
Andijan
Bokhara
Merv
Samara
R. Volga
Orenburg
R. Tobol
Omsk
R. Irtish
Ural R.
Caspian Sea
PERSIA
AFGHANISTAN
INDIA
70° East
80
60°
30°
50°
20°
30°
40°
50°
60°
70°
80°
90°
100°
110°
120°
130°
140°
150°
160°
170° E.
180°
170° West
160°
60°
50°
40°
30°
120°
130°
FINLAND
R. Khatanga
Bulun
R. Lena
Verkhoyansk
R. Kolima
R. Anadyr
Lower Tunguska R.
R. Viliui
Yakutsko
Okhotsk
Upper Tunguska R.
R. Lena
R. Aldan
Petropavlovsko
Nikolaievsko
Baikal
Chita
R. Amur
Blagovieshchensk
Kiakhta
MANCHURIA
Khabarovka
Vladivostok
COREA
JAPAN
Stanford's Geog.l Estab.t London

FIG. 157.

Travelling by train from Russia we pass the Urals and find ourselves in a region of cornfields and gardens. The peasants live in scattered villages, which consist of small wooden houses. Crossing a fine bridge over the river Irtish, the train runs into Omsk station. It is provided with electric lamps, waiting-rooms and a good restaurant. The soil in the valley of the Irtish is similar to the Black Earth of Russia. Part of the land is used for dairy farming, with Omsk as the market town.

Tomsk, on the Obi, is another agricultural centre. It is fifty miles from the main line of railway, with which it is joined by a branch line.

Six days after leaving Moscow the train reaches hilly country near Lake Baikal. Beside the lake is the town of Irkutsk, the capital of eastern Siberia. It is a meeting place for traders. Goods come by rail from east and west. Other merchandise comes by caravan from the south, and by sledge or boat from the north—up the valleys of the Yenisei and the Lena. This region is rich in minerals. Goldfields and coalfields have been discovered in the valleys of the Yenisei, Lena and Amur. In the last of these there are also precious stones and silver.

Vladivostok, one of the termini of the Trans-Siberian railway, has a harbour generally free from ice. Its trade will increase when eastern Siberia becomes more developed. The Siberian railway is connected by branch lines with Pekin, Port Arthur, Dairen and Seoul.

The long, wide rivers of Siberia are navigable in summer. But both rivers and the sea into which they flow are blocked with ice for many months each year. When open they form useful highways for trade. From the north natives bring furs, ivory and fish, taking in exchange meat, sugar, tobacco, tea, grain and manufactured articles. Krasnoyarsk, on the Yenisei, is an important centre for such trade.

Turan is a low plain, hemmed in on the south and east by the Elburz, Hindu Kush and Tien Shan mountains, but open to the cold influences of the north. Winters are cold, summers are hot. Little moisture succeeds in passing the huge mountain barriers. The region receives only about 4 inches of rain per year, and this comes chiefly in March and April. Turan is therefore a region of poor

steppe and desert. The northern part is occupied by nomadic Kirghiz tribes, who were described in Chapter XIV.

The southern portion consists of two republics, Turkmenistan and Uzbekistan, which are included in the Russian Union. Uzbekistan is practically the two provinces formerly called Khiva and Bokhara.

Two rivers, the Amu or Oxus, and the Syr, fed by the melting snows of the Pamirs, flow to the Sea of Aral. But the Hari Rud

FIG. 158.—CENTRAL ASIA.

Contour lines are marked at 6,000 and 8,000 feet, and dotted areas are above those altitudes.

and the Murghab from Afghanistan are lost in the desert somewhere north of Merv.

Strange though it may seem, there are towns in this region. Ruins indicate that there were even greater cities in the past. Samarkand was indeed, in the days of Tamerlane, the famous Mongolian conqueror, one of the largest cities in Asia.

Rivers make settled life possible by providing water for irrigation. The towns Merv, Bokhara, Khiva, Tashkend, and others, are in oases which yield sufficient grain and fruit for the people.

The towns are trading centres. Their bazaars are stocked with carpets, made perhaps in nomadic camps. There are also fine silks

and tea brought over high passes from China; skins, such as Persian lamb and caracal from Afghanistan, and other goods.

Trade has caused an interesting combination of means of transport. A railway runs from Krasnovodsk, on the Caspian shores, to Askabad, Merv and Bokhara, and then up the fertile Ferghana valley past Khokand. Here it meets the caravan routes from the passes in the Tien Shan. A railway comes from Orenburg up the valley of the Syr to Tashkend. Another railway joins Tashkend to the Trans-Siberian Railway. On the platforms of railway stations are large numbers of bales of cotton, bundles of carpets and other goods, brought in by camels, to be sent by train to Russia.

EXERCISES

1. Explain the difference between the basins of the Yangtse and the Hoang-ho with regard to density of population, towns, trade and crops. Illustrate your answer with sketch maps.

2. Make sketches to show the situation of Canton, Shanghai and Hankow, and write notes explaining how their position has fostered the growth of these cities.

3. Name the chief industries of Japan, and the chief industrial centres. What advantages has Japan for industrial development?

4. Make out a list of the agricultural and plantation products of the Malay Peninsula and the East Indies. Name the chief ports and illustrate with a sketch map.

5. Write a short account of the difference in mode of life and occupations of the people in south-east and south-west Asia, giving reasons for the difference.

6. Describe the country through which the Siberian railway passes from the Urals to the Pacific coast. Illustrate your answer with a sketch map, showing the railway and the chief towns.

7. Write notes on Baghdad, Bokhara, Khiva, Merv, explaining the growth of these towns. Show the position of each in a sketch map of south-west Asia.

SECTION III

INDIA

XXXII. POSITION, SURFACE RELIEF, SOILS AND MINERALS

I. POSITION

India has a central position in southern Asia. Its shape is an irregular quadrilateral, two sides being bounded by mountains and

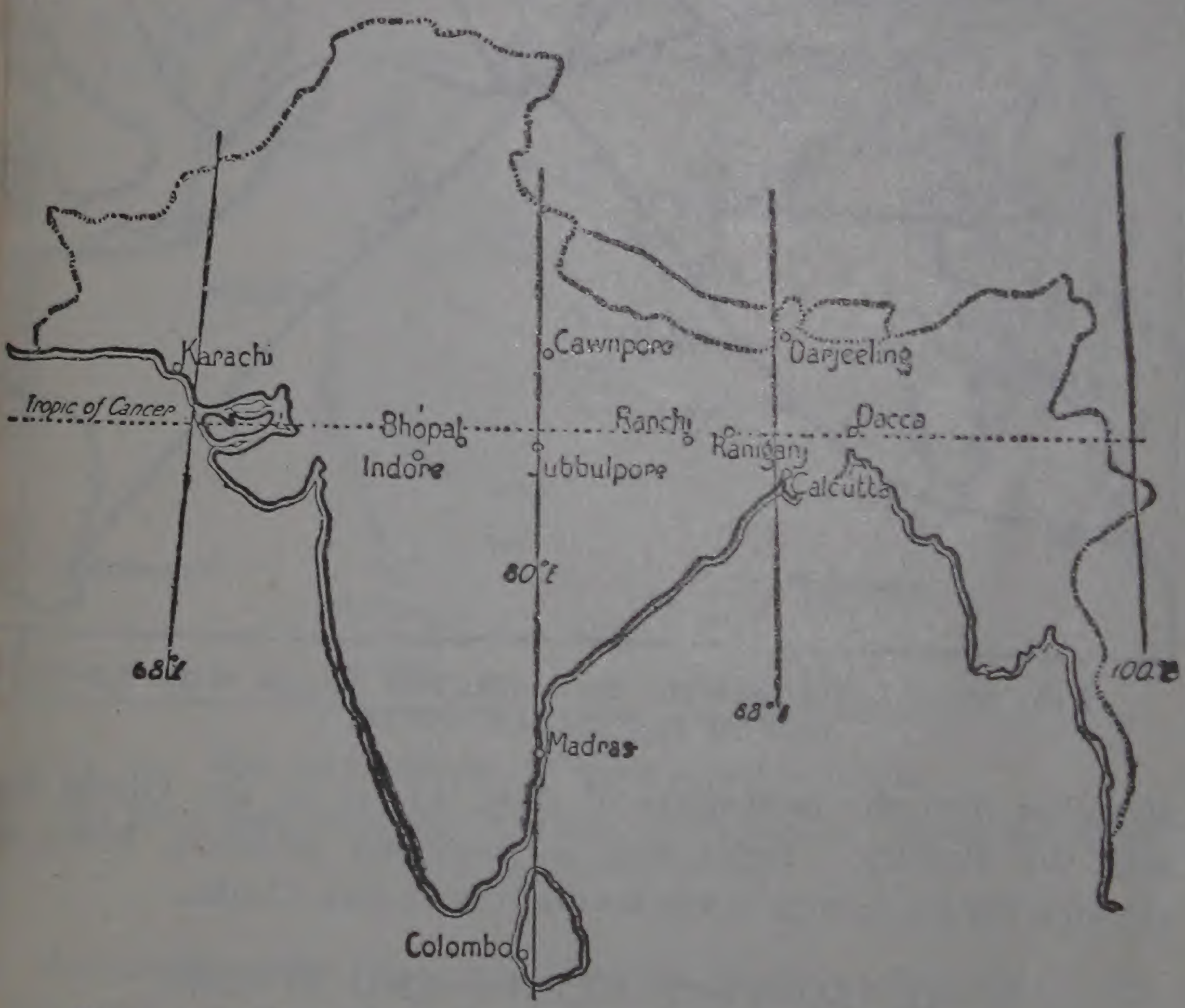


FIG. 159.—THE POSITION OF INDIA—A MEMORY AID.

Notice (1) the towns which are situated on, or near to, the Tropic of Cancer. (2) Meridian 68 passes through the Indus delta, just missing Karachi. (3) Meridian 88 passes through the Ganges delta, just missing Calcutta and Darjeeling. (4) Meridian 80 almost touches Colombo, Madras, Jubbulpore and Cawnpore.

two by seas. The Tropic of Cancer passes through the delta of the Ganges, and just south of the delta of the Indus. From this line India extends almost equal distances north and south—13° northwards and 15° southwards. The southern portion is a triangular mass that projects into the Indian Ocean, its apex being Cape Comorin. The northern portion is *almost* a triangle. It

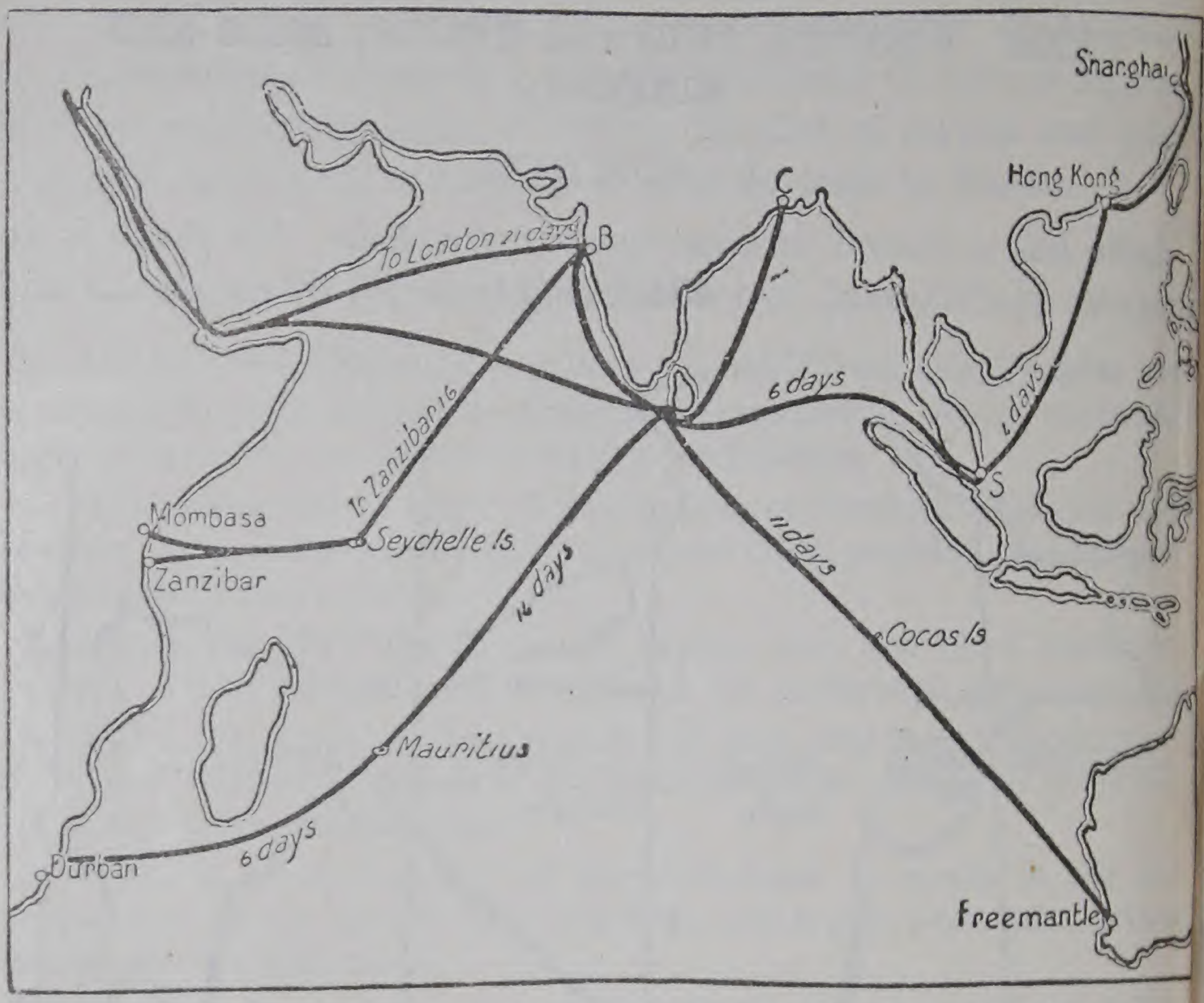


FIG. 160.—INDIA IS WELL SITUATED FOR TRADE WITH LANDS AROUND THE INDIAN OCEAN.

stretches into the land-mass of Asia, as far as the Hindu Kush and the Pamirs. India has a good sea position, being well situated for trade with lands around the Indian Ocean.

II. SURFACE RELIEF AND RIVERS

India has three physical divisions. These are (1) the mountain regions of the north and north-west, (2) the Indo-Gangetic plain, (3) the southern plateaux—consisting of the plateau of Central India and the Deccan.

The mountain regions. The Himalayas are fold mountains

crumpled against the plateau of Tibet. They consist of several ridges varying in altitude, and not always parallel to each other. The system is a huge snow-capped barrier, extending for over 1200 miles along the north of India. Roads through the mountains go over passes 17,000 to 19,000 feet above sea-level. More than 100 peaks exceed 20,000 feet, and one, Mount Everest (29,141), is the highest mountain in the world.

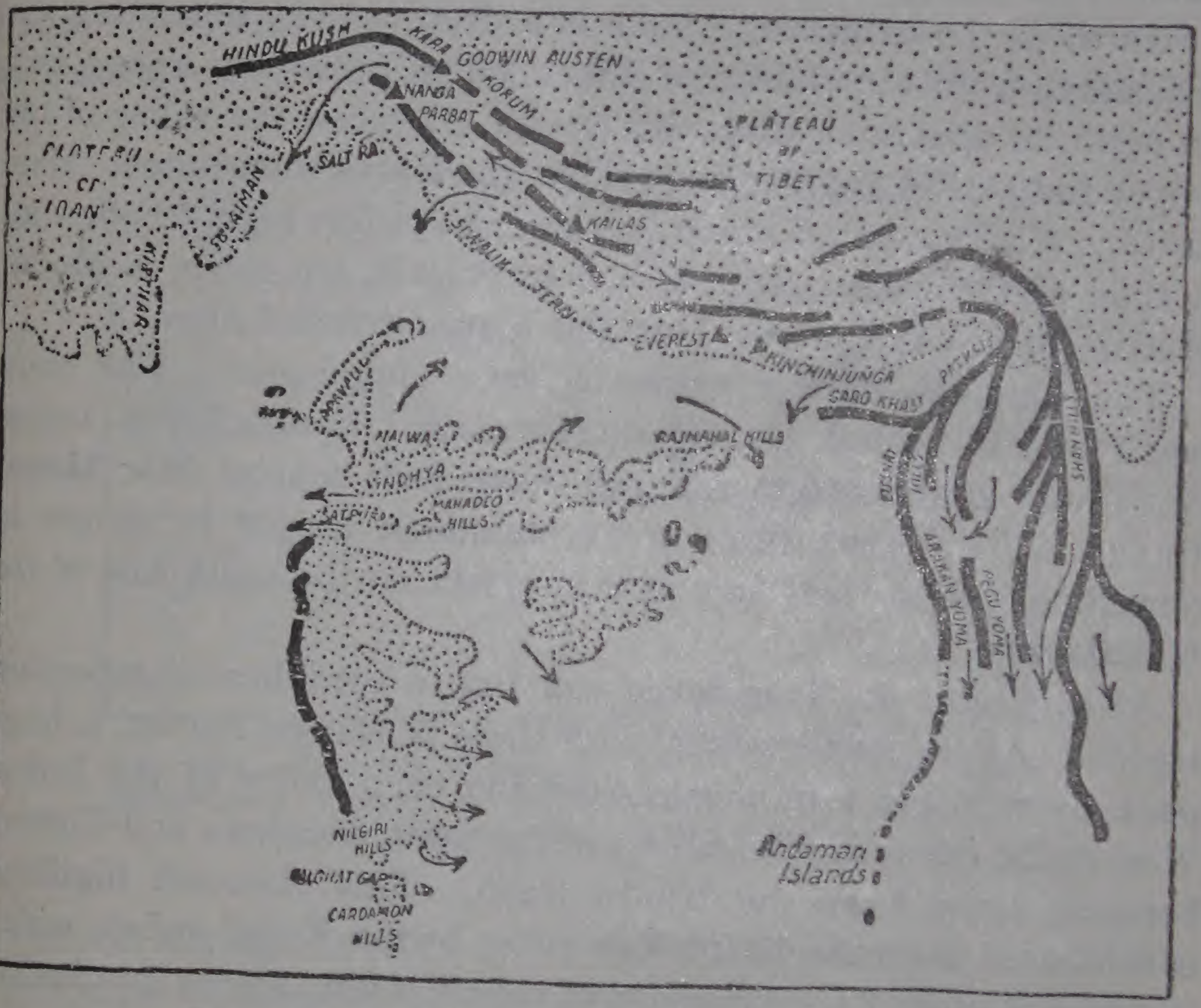


FIG. 161.—PLAN OF HIGH LANDS, INDIA.

The black lines show the direction of the ranges. **Name the rivers** indicated by the arrows.

Approaching the Himalaya from the south, we find first a line of foot-hills, which can be traced for hundreds of miles along the edge of the system. In the western portion the foot-hills are known as the Siwalik Hills. Behind the foot-hills there are in many places belts of rather lower land, called *duns*, composed of sediment and river gravels washed down from the higher ridges. Such a belt

is Dehra Dun behind the Siwaliks. This area of foot-hills and duns is a well-watered region, intersected everywhere by valleys. It has a large population. Lines of towns and villages extend up the valleys into the mountains.

Next come the **Lower Himalayas.** These are ridges with peaks rising to an altitude of from 6,000 to 12,000 feet. Behind these there is the **main Himalaya** ridge, with peaks over 20,000 feet high and always snow-capped.

North of the main ridge there is a deep trough, separating the Himalaya from the plateau of Tibet. The Indus and Sanpo flow in opposite directions along this trough. Beyond the valley of the upper Indus rises another huge ridge, the **Karakoram** range. Here there is a lofty peak, Godwin Austen, 28,250 feet high. Following a spur of the Karakorams to the south-east, we come to Mount Kailas (22,028 ft.), overlooking the Manasarowar Lakes.

The drainage of this region is very complicated. The main watershed is behind the Great Himalayan Range. The Indus, Sutlej and Brahmaputra (Sanpo), have their sources near Mount Kailas. They break through the mountain ranges by gorges of remarkable depth, and flow into the plain on the south side of the Himalayas.

At each end the Himalayas run into a complicated mountain region. At the north-western end there is Nanga Parbat, a huge peak over 26,000 feet, overlooking the deep valley of the Indus. West of the Indus are the valleys of the Swat, Panjkora and Chitral, between spurs from the Hindu Kush. This dissected highland is separated from the Safed Koh ridge by the Kabul valley, which with the Khyber Pass forms one of the chief land routes into India.

Southwards run the Sulaimans, and farther south again the Kirthar mountains, buttressing the plateau of Iran. In this dry region there is little vegetation to protect the ground against weathering. After rains, streams dash down the steep slopes, sweeping with them earth and loose boulders. In many places they have made deep gorges, such as Chappar Rift, on the way from Sibi to Quetta. These are generally dry, but they are liable to sudden floods.

From the eastern end of the Himalaya many ridges run through Assam and Burma. A long ridge, known as the Patkai Hills and

Barail Range, bends sharply round into Assam and throws off a spur to the west, called the Khasi and Jaintia Hills and Garo Hills.

Mountain routes. The Himalayas are a mighty barrier, but certain passes allow trade to be carried on between Tibet and India. Several small valleys lead from the Ganges plain into Nepal, and from Katmandu, the capital of that state, there are two routes over the main ridge of the Himalaya. Farther east a railway runs to Darjeeling, a centre for the Tibetan wool trade, and from this town there are several northward routes through Sikkim. On the western

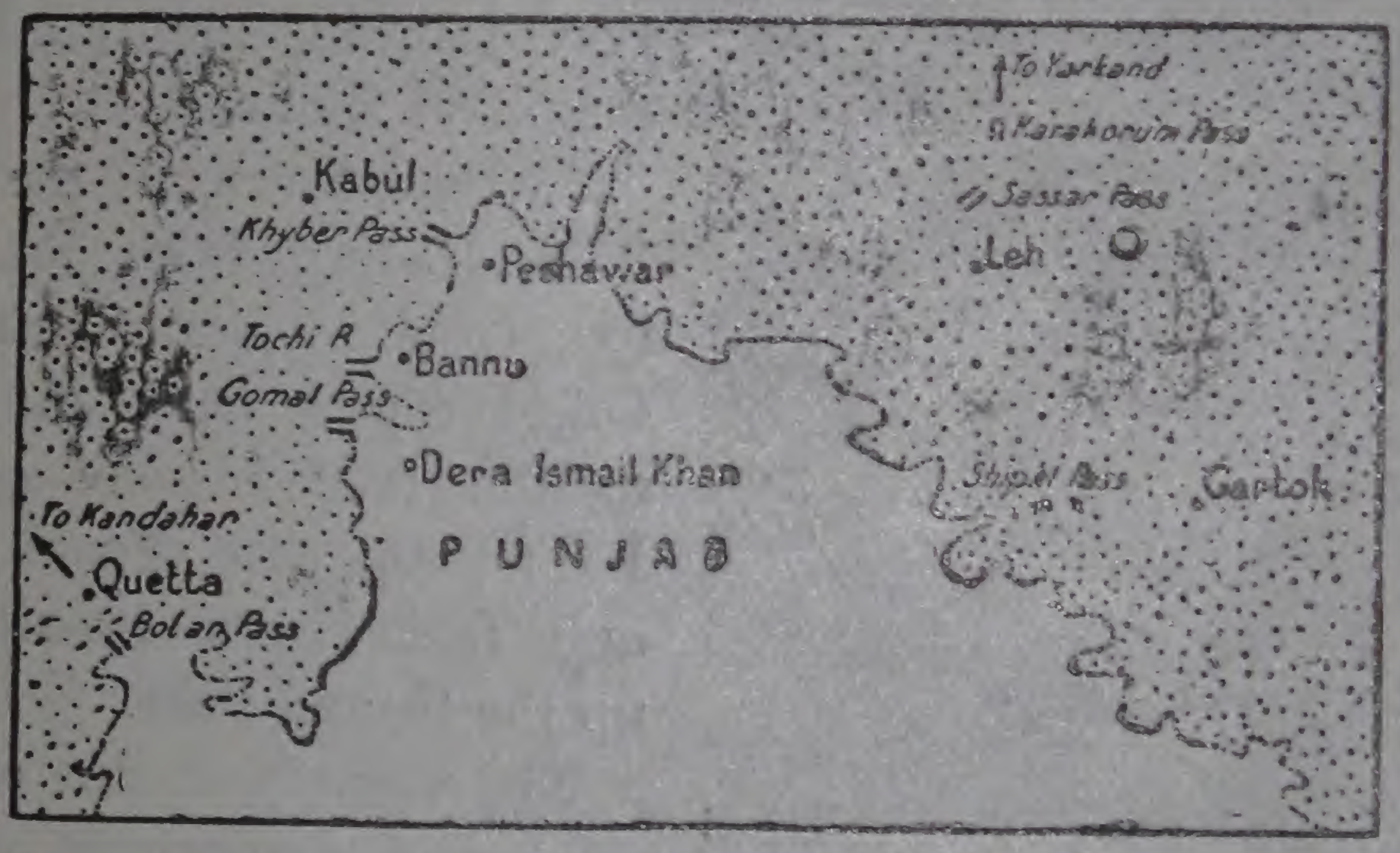


FIG. 162.—SKETCH SHOWING THE SITUATION OF SOME IMPORTANT PASSES IN NORTH-WEST INDIA AND THE TOWNS WHICH COMMAND THE ROUTES.

border of Nepal, the Kali valley leads to Garbyang, a trading centre more than 10,000 feet above the sea. The road then mounts another 7000 feet to the Lipu Lekh pass. Farther west still there is another route to Tibet by way of the Sutlej valley and the Shipki pass.

Two important trade centres are situated at a great altitude behind the main Himalaya ridge. These are Leh and Gartok. The summer fair at Gartok brings traders from many lands—from India, Kashmir, China, Mongolia, and Turkestan. Leh is the focus of trade routes up and down the Indus, and over the Karakoram and Sasar passes from Yarkand.

But the chief entrances to India are on the north-west frontier.

These routes admitted the white race to the country some 4000 years ago, and hordes of Mongol invaders in later times. Chief amongst the numerous passes that lead across the frontier is the Khyber Pass—the road from Kabul to Peshawar. For many centuries before the sea route from Europe to India was discovered, this was the great highway of trade between East and West. A railway has been laid through the pass. It joins Landi Khana, on the Afghan frontier, with Fort Jamrud, the terminus of the N.W. Railway.

FIG. 162 (*a*)
A FRONTIER TRIBESMAN.
By courtesy of the Indian State Railways.

Farther south is the Bolan Pass, leading from Jacobabad to Quetta and Kandahar. Other routes from the Indus to the Iran plateau go from Bannu up the Tochi valley, and from Dera Ismail Khan up the Gomal Pass.

The scenery of this region is wild and impressive and the country is inhabited by very warlike tribes.

The Indo-Gangetic Plain. South of the Himalaya lies the plain of the Indus and Ganges. The Aravalli Hills, running north-eastwards, form part of the watershed of the Ganges basin. But between Jaipur and Patiala the ground is only just high enough to separate the waters of the Jumna from those of the Sutlej. The Indo-Gangetic plain therefore stretches unbroken across India, a distance of 1500 miles. Its western margin lies next to the edge of the Iran plateau. Its eastern end stretches along each side of the Garo and Khasi Hills to the Patkai Range and Lushai Hills of Burma.

Once this large area was a sea. Evidence of this is seen in the salts which appear at the surface in drier areas during the hot

FIG. 163.—THE KHYBER PASS.

season. Earth movements uplifted the bed of the sea, rivers completed the work by making the land level. The Indo-Gangetic plain was made by the rivers after which it is named. Year after year, through unnumbered centuries, the Indus, Ganges and their tributaries washed sediment from the sides of the Himalaya. This sediment they deposited, layer upon layer, on the low ground. Time after time they must have changed their courses, so spreading sediment over wide areas. Many old river channels can be traced in the Punjab.

Thus the Indo-Gangetic plain consists of **alluvium.** It is one of the greatest alluvial tracts in the world. The soil is deep, and in many places rich. But in some areas the land has been exhausted through bearing numerous crops without manuring. West of Cawnpore there is much waste land owing to deposits of a saline nature called "Kallar" (Reh). The rivers have levelled the land, hence they flow slowly through the plain. They still flood the country in the lower reaches, enriching the land with fresh sediment. During the flood season, every 400 lbs. of Ganges water contains 1 lb. of earthy matter. Much of the sediment the rivers now bring down goes to extend their deltas seaward.

The Indus. The first white invaders of India settled on the banks of a river which they called "Sindhu" (the river). The name gradually changed to "Indus." The region was then known as the land of the Indus, that is "India," a name which was afterwards applied to the whole country.

The Indus rises near Mt. Kailas, not far from the sources of the Sutlej and the Sanpo. The Indus first flows north-west in a deep trough on the plateau, past the town of Leh, and under the shadow of the Karakorams. Near Gilgit the course changes. The Indus flows round Nanga Parbat (26,600 ft.), breaks through a deep gorge, and reaches the plain at Attock (="the Limit"—of navigation).

Now flowing south between the end of the Iran plateau and the Salt Range, it receives the Kabul, Tochi, Gomal and other streams from the plateau. The chief tributaries are the "five rivers" of the Punjab—the Jhelum, Chenab, Ravi, Beas and Sutlej—which rise in the Himalaya. These combine and join the main river near Mithankot. From this point to the sea the Indus flows near the borders of the Thar Desert, and it receives no important tributary.

At Sukkur and Rohri the Indus flows through a gap in a low range of limestone hills, and is actually above the level of the alluvial plain. The railway is carried across the river at this point by a magnificent cantilever bridge.

As the Indus and the Punjab tributaries are fed by melting snows, their volume varies greatly. In spring the waters are low ; a little later the rivers are in violent flood. Partly because of this, there are few large towns on the banks of the lower Indus, and Karachi stands away from the delta.

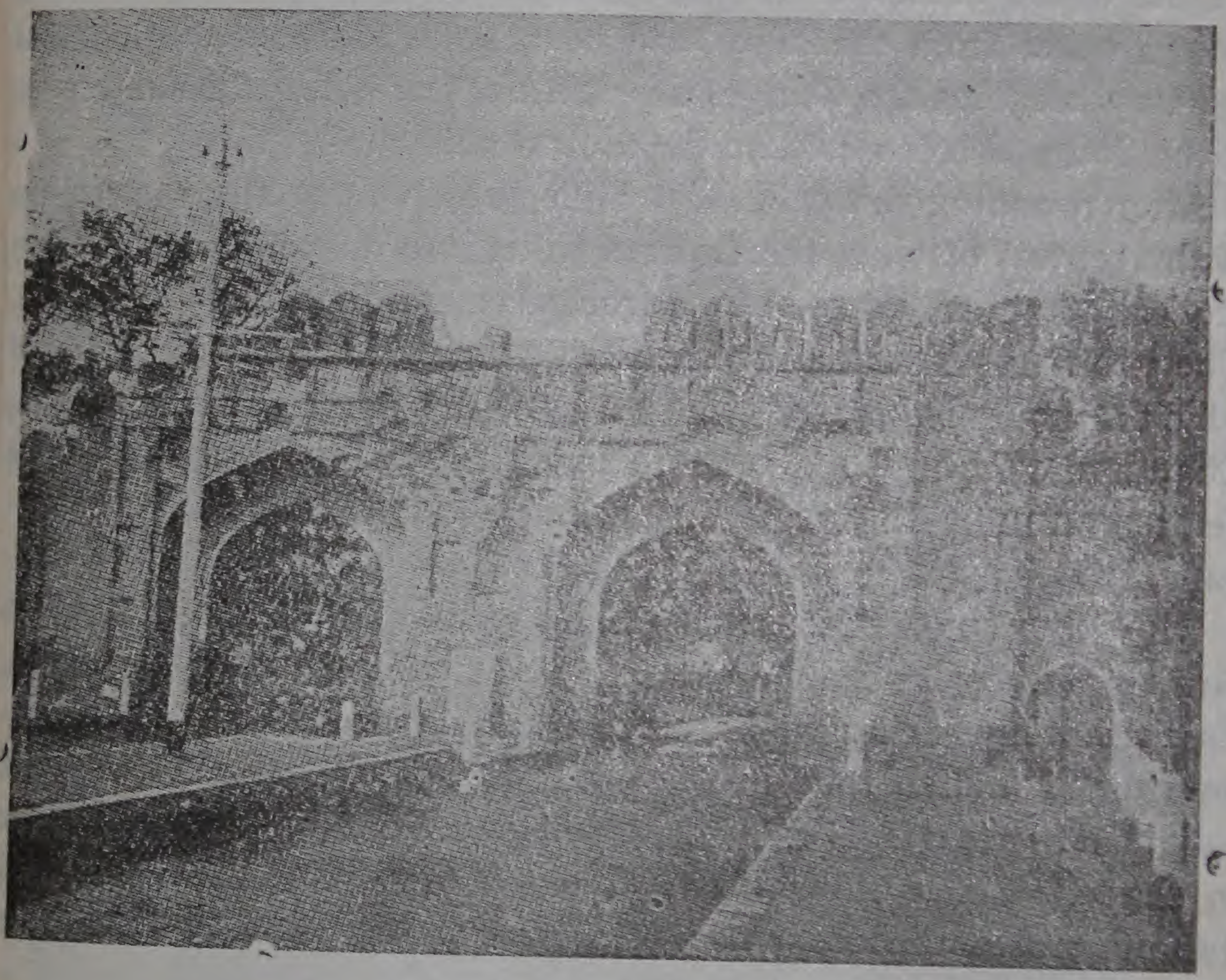


FIG. 164.—KASHMIR GATE, DELHI.

The Ganges. The Ganges basin lies between the Himalaya and the plateau of Central India. The river receives tributaries from both these highland areas, but those from the Himalaya are both larger and swifter. This explains the fact that the Ganges is nearer to the edge of the plateau than to the Himalaya. The force of the tributaries from the north pushed the river southwards in past times.

A melting glacier, high up on the Tibet frontier, gives rise to the Ganges. The river descends rapidly through rocky gorges, and,

after a short "valley stage," leaves the Himalaya at Hardwar. Here begins its long "plain stage," in the course of which it receives many feeders and passes innumerable villages and towns.

The Jumna also starts in a glacier and flows through the Siwalik Hills into the plain. It winds along past Delhi and Agra, gathering to itself the Chambal and other streams from the Vindhya Range, and pours the combined waters into the Ganges at Allahabad.

The Ganges then winds its way past Benares and Ghazipur to Patna, receiving tributaries from the Himalaya. First there is the Gumti which comes down past Lucknow, then the Gogra which brings water from the high land near Lake Manasarowar. Next the Gandak joins the Ganges near Patna, just below the confluence of the Son which comes from the central plateau.

After rounding the Rajmahal Hills, which form the eastern tip of the central plateau, the Ganges splits into distributaries. Then the Brahmaputra comes down from Assam round the Garo Hills. The two rivers enter the sea by a large number of channels, chief of which is the Hooghly. On the banks of this branch stand Calcutta, Chandernagore and many more towns. The seaward end of the delta is an unhealthy region of swampy jungle called the Sundarbans.

The Southern Plateaux. India south of the Ganges basin is built largely of ancient crystalline rock. It was once an island. Earth movements uplifted the Himalaya, and caused a great outpouring of molten rock in the plateau region. This molten rock solidified in great beds of lava. The lava region is almost triangular in shape. Lines drawn from Cambay to Jubbulpore, and from Jubbulpore to the coast near Goa, enclose practically the whole volcanic area.

This volcanic activity affected the drainage of the plateau. Amongst the large rivers, the Narbada and the Tapti flow over the lava region to the Gulf of Cambay. The remaining rivers flow to the Bay of Bengal.

Thus there are two plateaux in southern India. The northern one is the plateau of Central India and the other is the Deccan. The Central India plateau extends from the Aravalli Range in the west to the Rajmahal Hills of Bihar. It sheds many streams north to the Ganges, and a large number south to the Mahanadi and the Kistna.

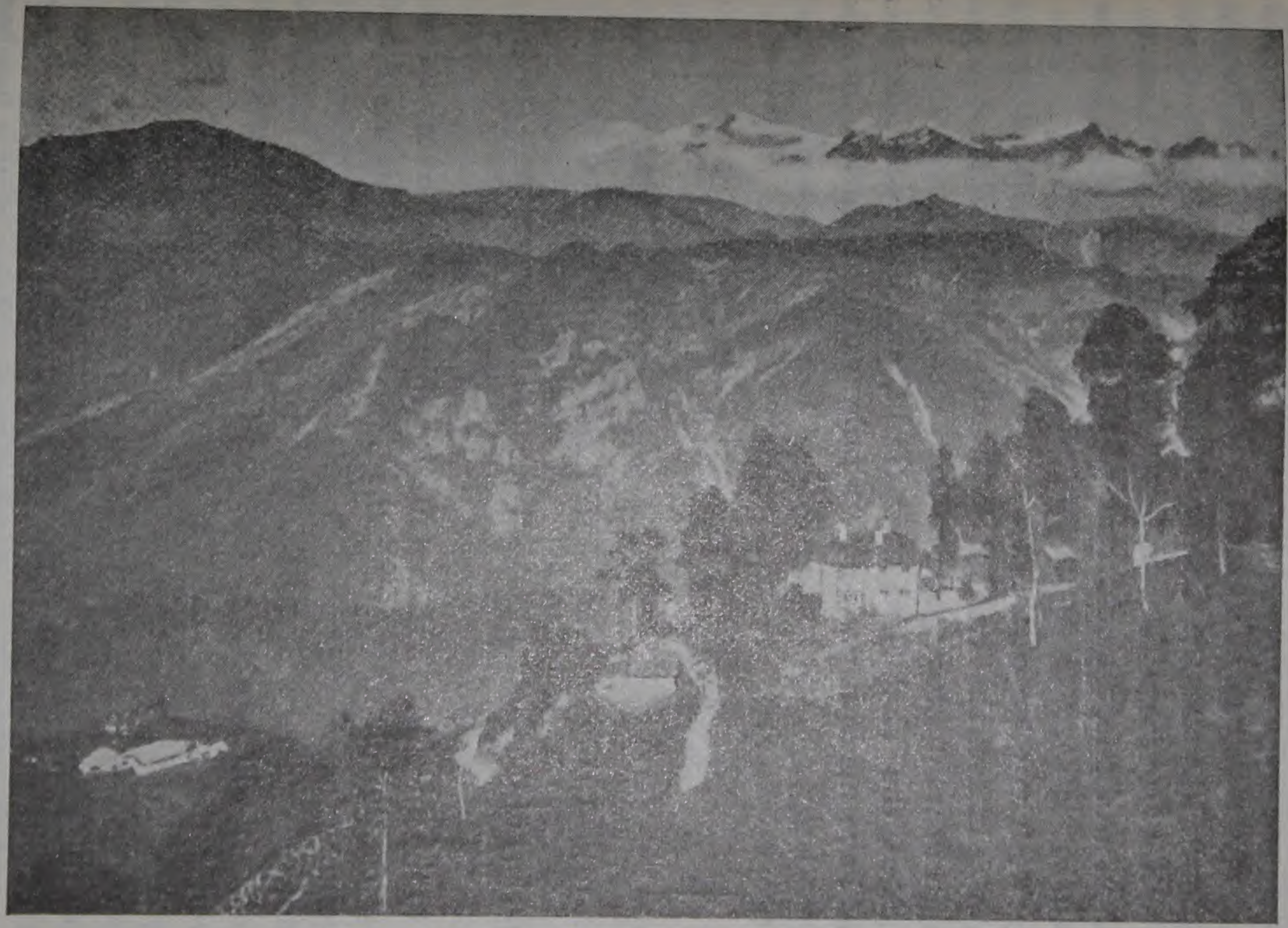


FIG. 165.—THE HIMALAYAS FROM DARJEELING.
By courtesy of the Indian Tea Association.

The Narbada and Tapti have cut wide valleys in the western end of the plateau, leaving the Satpura Range and the Mahadeo Hills standing boldly between them.

The Deccan extends from the Tapti valley to the Nilgiri Hills. Then comes a remarkable break called the Palghat Gap, between the Nilgiri Hills and the Cardamom Hills. But the hard ancient rock of the southern Deccan goes through to Cape Comorin. Ceylon is a detached block, built of the same kind of rock as the Deccan.

The western edge of the Deccan is an escarpment of varying altitude. It faces the Arabian Sea like a gigantic wall, 4000 to 5000 feet high near Bombay, 7000 to 8000 feet high in the south. But two passes, the Thal Ghat near Nasik, and the Bhor Ghat near Poona, have made it possible for railways to be carried from the

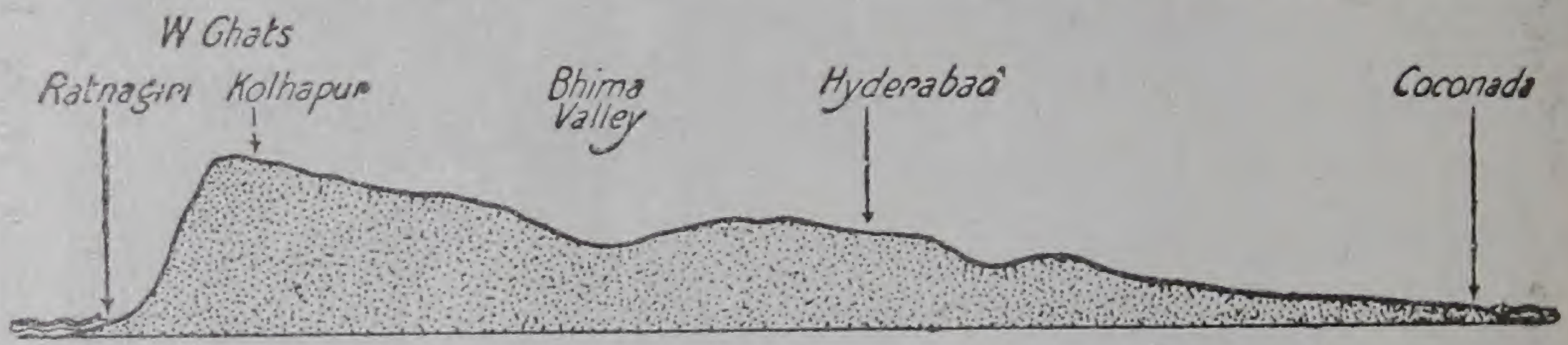


FIG. 166.—DIAGRAMMATIC SECTION ACROSS THE DECCAN, SHOWING THE GENERAL SLOPE TOWARDS THE EAST.
The line of this section passes through the Godavari-Kistna gap in the Eastern Ghats.

coast to the interior. Between the escarpment and the sea there is a narrow coastal plain. Along the Malabar coast this consists of sedimentary rock.

From the Western Ghats the Deccan slopes away to the Bay of Bengal. It will be noticed that the Godavari, the Kistna and its tributaries the Bhima and the Tungabhadra, rise almost in sight of the Arabian Sea and flow down the plateau to the Bay of Bengal. These rivers and the Penner and Cauvery have so cut up the eastern edge of the plateau, the Eastern Ghats, that it consists merely of a series of hill ranges. They have also carried a large amount of sediment from the surface of the plateau. Some of this has been deposited in their valleys, but a large amount is distributed along the coast between the Ganges delta and the Gulf of Mannar.

Indian Scenery. The scenery of the Himalaya is wildly grand. Torrential streams plunge over rocky ledges and roar through deep

and narrow gorges. Higher up there are frowning crags overlooking rock-strewn valleys swept by piercing winds, and huge glaciers gliding slowly down from the ice-fields of the mountain crests. In the plains the scenery is somewhat monotonous. It depends for variety upon changes in vegetation. The action of rivers on the black basaltic lavas and ancient crystalline rocks of southern India has produced scenery of a different type. Valleys are wider than those of the Himalaya, and their gradient is not so steep. The volcanic region has flat-topped hills, with dark massive pinnacles of rock near the coast. In the interior there are hills and plateaux in every landscape. Near the coast they are forested, but in the drier interior trees give place to grass and scrub. The Nilgiris—mountains rather than hills—contain beautiful scenery. Broad grassy slopes rise high between well-wooded valleys, and steep escarpments give fine views over the surrounding lowlands.

III. SOILS AND MINERALS.

As we noticed in Chapter IX, **soil** is formed by the action of rivers, rain, ice, wind and other natural forces upon the solid rocks of the earth's crust. In elevated tropical areas such as southern India, rapid changes of temperature break up the rock surface, producing a soil known as **laterite**. Tracts of reddish laterite occur in the central plateau and parts of the Deccan.

Much of the soil now used for raising crops was formed before man appeared on the earth. But the process is still going on, and it will continue as long as rain falls and rivers flow from higher to lower ground.

The richest soil is the **alluvium** of river valleys and plains. This is because the mineral matter it contains has been well broken up. With water it therefore forms mineral solutions which can be absorbed by the roots of plants. Rich soil alone is not sufficient for plant growth. Water must be supplied by rain or by irrigation works. Where rainfall is deficient the natural vegetation consists of grass or scrub. Examples occur on the borders of the Thar desert and parts of the Deccan. A rainless region is desert whatever the soil may be like. But irrigation can reclaim even desert land.

Alluvial soil is found in the valleys of all countries. Frequently it extends over wide areas—alluvial plains—as a result of floods in past times. Such a plain is that of northern India. It is one of the largest and richest alluvial plains in the world. Smaller plains occur along the coasts of the peninsula, and in the lower part of the course of the Irrawaddy.

The rocks of the peninsula are particularly hard. But all rocks yield, in time, to the action of natural forces. The surface of the black lavas of the north-west and the Kathiawar peninsula has broken up into a dark heavy soil. It contains a good deal of iron, and it retains moisture. This soil has been found valuable for cotton-growing.

On the hills between the valleys of the Deccan rivers there is often only a thin layer of soil overlying the ancient rock. Much of it is not fit for ploughing, but it bears herbage suitable for the grazing of cattle.

In addition to breaking up rock surfaces into soil, water performs other useful work. It dissolves mineral matter and stores it in river channels, hollows, fissures and other places. Thus are formed beds and veins of metallic ores. Water also plays a part in the formation of coal. Think of luxuriant jungles like that of the Terai, growing upon the earth hundreds of thousands of years ago. The land on which the forests grew began to sink. In time it was overwhelmed by the sea. Rivers then laid down beds of sediment on the submerged forests. Pressure under such conditions gradually converted the vegetation into coal. A long period is required for this process, and the best coal is therefore found amongst the older sedimentary rocks.

Small **coalfields** have been discovered in Assam and the Punjab, and larger ones in the basins of the Godavari and its tributary the Wardha, and also in Bengal, Bihar, and Orissa. **Iron ore** occurs in scattered areas amongst the hills of the Deccan, and there are stores of excellent ore near Salem in Madras, in Bihar, and in Orissa.

The most important region for both **coal and iron** is in Bengal, Bihar, and Orissa. The coalfield is at the eastern end of the central plateau, in the valleys of the Son and the Damodar. This coalfield produces four-fifths of the coal obtained in India. The chief centres of the industry are Jherria, Asansol and Raniganj. The

Barakar ironworks were started because iron ore was found amongst the coal seams, but local ore is no longer used.

Iron ore is worked not far away, in the Mayurbhanj (Gurumaisini Hill), and Singhbhum districts of Orissa. The deposits in the latter area are particularly good. By a fortunate circumstance, limestone, which is required for smelting the ore, and manganese, which is used in making hard steel, are also found in the same region.

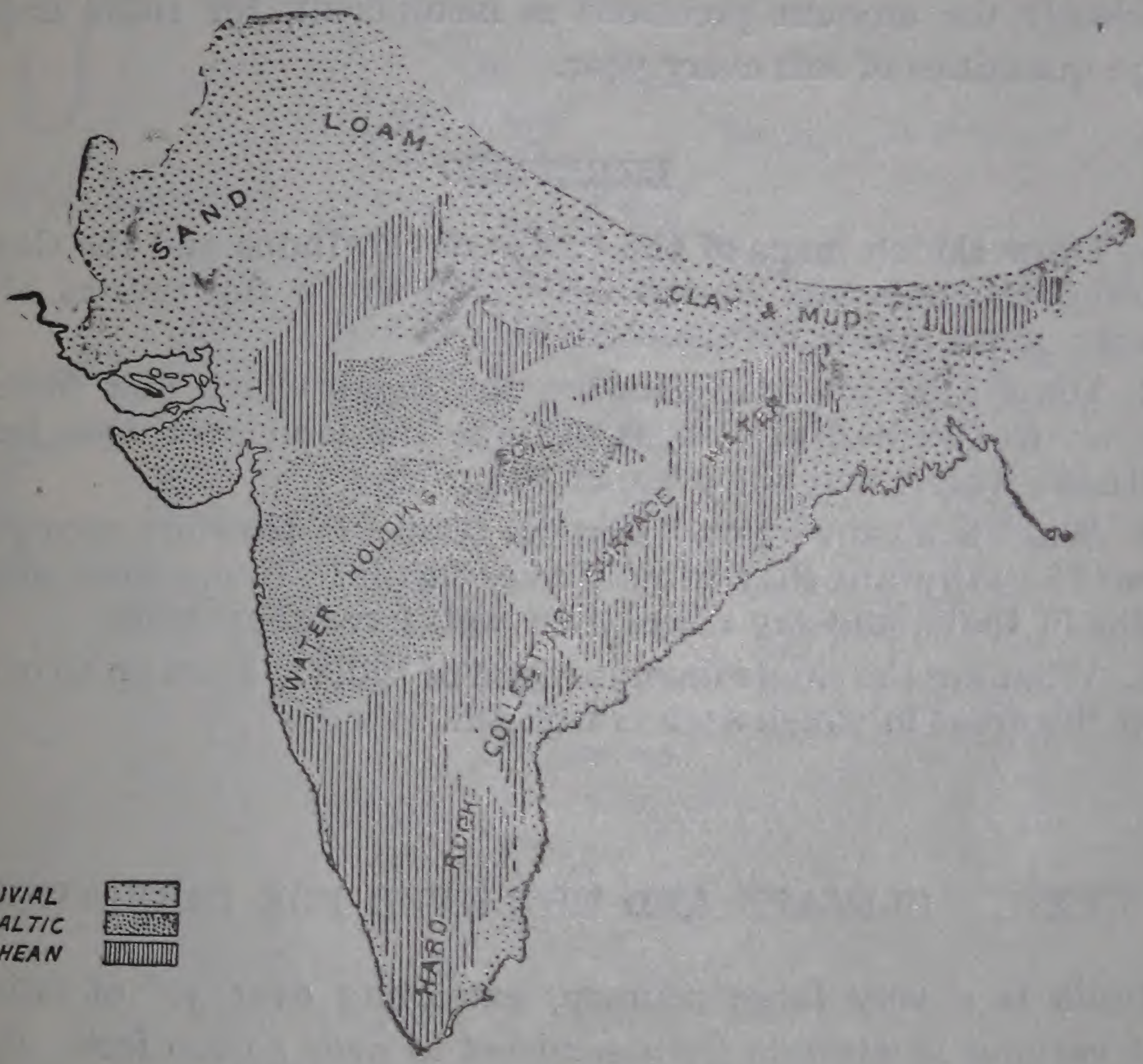


FIG. 167.—SOILS MAP OF INDIA.

The presence of these minerals has led to the establishment of the well-known Tata Iron and Steel Works at Tatanagar (Jamshedpur). At these works thousands of people are employed in the manufacture of steel, machinery, chemicals and fertilisers. The Bengal Iron and Steel Company, which has blast furnaces and a foundry near Barakar, uses iron ore from Kolhan (Orissa). India has very large deposits of manganese ore, the most important being in the Central Provinces, Madras, and Mysore.

Gold is worked in the Kolar goldfields of Mysore, and copper at

many places in the Himalaya, whilst Bihar is among the world's chief sources of **mica.** **Petroleum** is worked in the Punjab near Rawalpindi.

Salt is obtained in several ways. It is quarried in the form of rock-salt in the Salt Range of the Punjab. At many places along the coasts it is extracted from sea water by evaporation, and the same process furnishes supplies from the salt lakes of Rajputana. Evidently the amount produced is insufficient, for India imports large quantities of salt every year.

EXERCISES

1. Draw sketch maps of the basins of the Indus and the Ganges, shading the hills and mountains which shape the courses of the rivers; mark and name the chief towns.

2. Draw a sketch map showing the rivers which flow from the Deccan to the Bay of Bengal. Shade the land over 1000 feet in altitude. Insert and name the chief towns.

3. What is meant by an "alluvial plain"? How are such plains formed? Why are they usually very fertile? Name some alluvial plains in India, and say where their soils have come from.

4. What are the chief minerals found in India? Mark on an outline map the areas in which each is worked.

XXXIII. CLIMATE AND THE NEED FOR IRRIGATION

India is a very large country, extending over 30° of latitude, and varying in altitude from sea-level to over 20,000 feet. Hence there are considerable variations in climate.

The Government Meteorological Department divides the year into two main seasons, each of which is subdivided thus:

1. **The Season of the North-East Monsoon.**
   - (*a*) January and February, the Cold Weather Season.
   - (*b*) March to mid-June, Hot Weather Season.
2. **The Season of the South-West Monsoon.**
   - (*a*) Mid-June to mid-September. Season of General Rains.
   - (*b*) Mid-September to December. Season of Retreating Monsoon.

The climates of India are controlled largely by monsoon winds. Generally, monsoon regions have a two-season year, viz., a hot wet

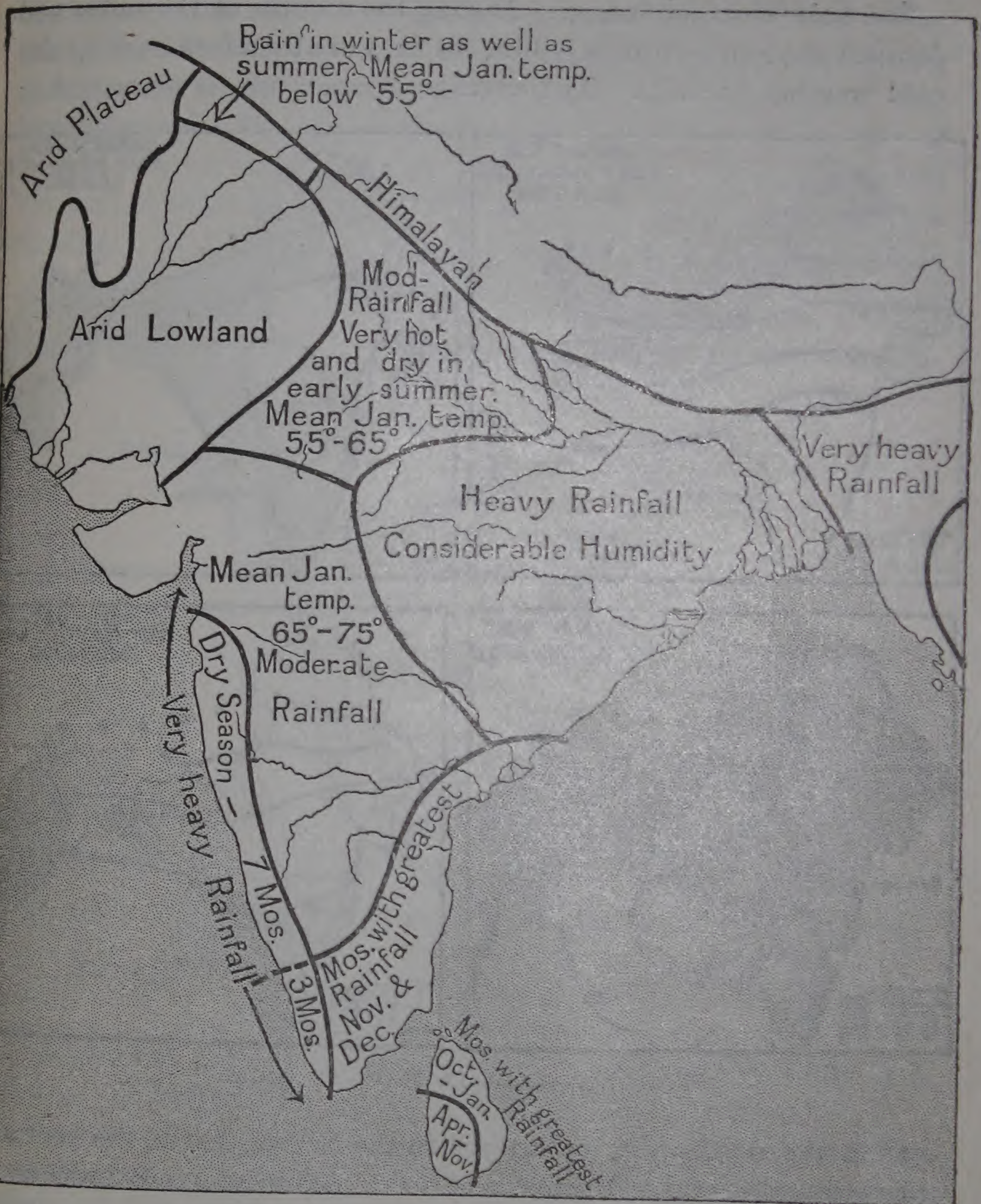


FIG. 168.—THE MAJOR CLIMATIC REGIONS OF INDIA.

season when the prevailing winds are from the sea, and a cool dry season when the winds are blowing towards the sea. The changes of pressure which cause these reversals in the direction of the winds

were described in Chapter VII. We can now, therefore, consider the climate of India in greater detail.

The Cold Weather Season. During the months of December and January the sun's altitude is low, his rays are therefore slanting and cold weather prevails. The average temperature is about 50° to

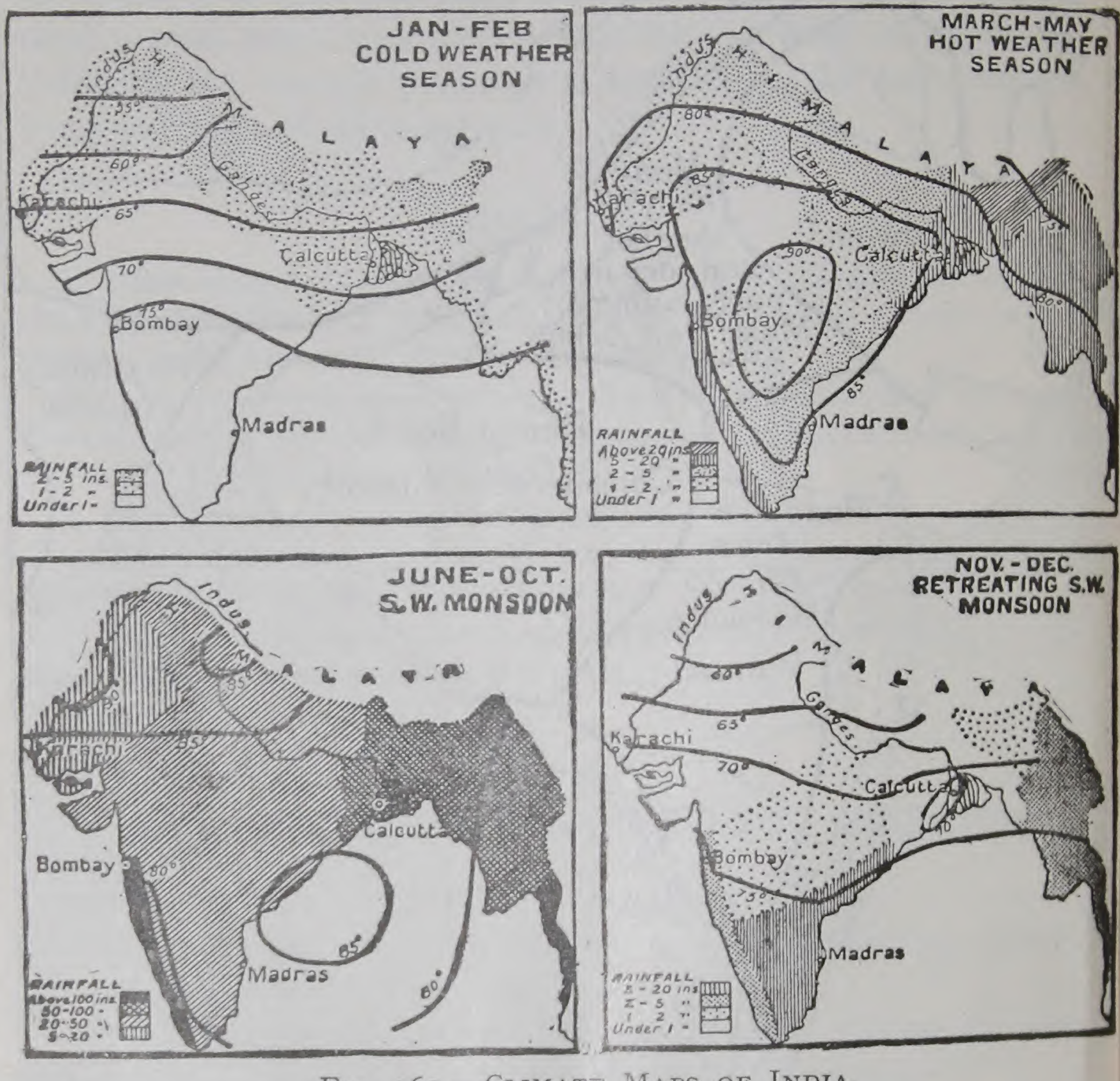


FIG. 169.—CLIMATE MAPS OF INDIA.

55° in the north-west, 55° to 70° in the Ganges basin, the central plateau and northern Burma, and 70° to 80° in southern India and Burma and in Ceylon. In coastal regions the temperature does not vary so much as it does in the interior (Fig. 170).

Generally the weather is fine, the sky almost cloudless, and India enjoys weeks of glorious sunshine. But occasionally cyclones come from the Iran plateau and travel across the Indo-Gangetic plain.

They cause snow to fall in the Himalayas, and they bring rain to the lower land. This is a great boon to the agricultural workers of north-west India, for it enables them to grow winter crops of grain.

The Hot Weather Season. After the sun has passed the equator (21st March) on his northward journey, the hot season begins. Sea breezes moisten the air of the land on both sides of the Bay of Bengal. In the interior the air is dry, the sky is still cloudless, and the heat steadily increases as the sun's rays become less and less slanting. At Simla and Darjeeling the mean monthly temperature

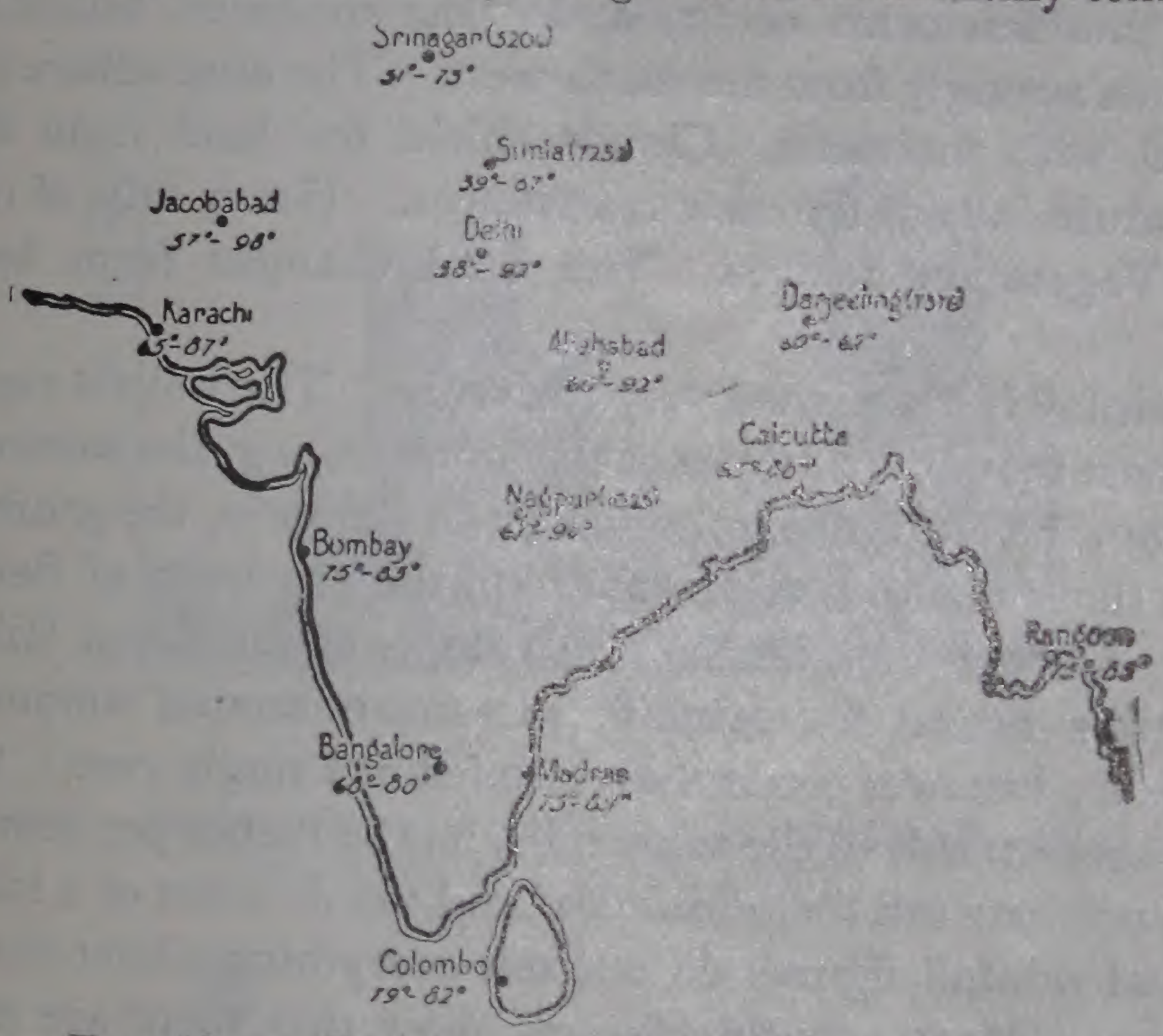


FIG. 170.—THE MEAN TEMPERATURE OF THE HOTTEST AND COOLEST MONTHS AT A NUMBER OF TOWNS IN INDIA.

The figures after the names of three of the towns give the altitude in feet.

never reaches 70°. But at Allahabad, Cawnpore and Delhi it is over 92° in May, whilst at Jacobabad in June it is 98°.

Outdoor work is impossible in the middle of the day. Vegetation becomes dry and withered-looking. Sometimes violent winds arise; they cool the air, but in dry regions they raise clouds of dust which make day as dark as night. Winds of the same kind sometimes arise in Bengal, Assam and Burma, but, instead of dust, they bring showers of rain that gladden the heart of the tea-planter.

Southern India and Ceylon are warmer than the north of India

during the cold season, but cooler during the hot season. The highest mean monthly temperature of Colombo is 82° (in May).

Season of General Rains. In the middle of June heat and drought are almost unbearable in the plains. This helps to produce low atmospheric pressure in that area. Then comes a change. Winds begin to make for the low-pressure area. The south-east trades cross the equator, and continuing north are deflected to the right. Thus they appear in India as south-west winds, and they have come over thousands of miles of water. Clouds gather. Violent thunderstorms occur, and "the monsoon bursts." The wind blows strongly from the south-west. The atmosphere becomes saturated with moisture. Clouds shield the land from the sun. Temperature falls as the season advances. Heavy falls of rain take place. Vegetation revives. The land changes from brown to green.

But rainfall is distributed very unevenly. The wettest regions are those where mountains intercept the monsoon, *e.g.* the western shorelands from the Gulf of Cambay to Cape Comorin, the south-west of Ceylon, the shorelands of Burma, and the provinces of Bengal and Assam. Cherrapunji, on the south slopes of the Khasi Hills, holds the world's record for rainfall, the mean annual amount being 458 inches; but over 900 inches once fell in a single year. Shillong, on the northern side of the same hills, has 82 inches per year. What a difference between the *windward* and the *lee* sides of a hill range!

Annual rainfall figures do not tell everything about the rainfall of a place. Mean monthly figures show that there are important variations. This will be seen on examining the table below. Colombo, for example, has two seasons of heavy rains. The difference between the rainfall at Colombo and at such a place as Calcutta is best shown by a diagram (Fig. 171).

MEAN MONTHLY RAINFALL, TO THE NEAREST INCH, EXCEPT WHEN THE AMOUNT IS LESS THAN ONE INCH.

Calcutta -	·3	1	1	2	6	11	12	13	10	4	·6	·3
Colombo -	3	2	5	11	12	8	5	4	5	14	13	6
Bombay -	·1	0	0	·1	·5	21	25	15	11	2	·5	·1
Rangoon -	·1	·2	·2	2	12	18	21	20	16	7	3	·1
Cherrapunji	·7	2	11	32	52	105	110	77	53	14	2	·1
Delhi - -	1	·6	·7	·3	·7	3	8	7	4	·4	·1	·6
Peshawar -	2	1	2	2	·7	·3	2	2	·7	·2	·6	2

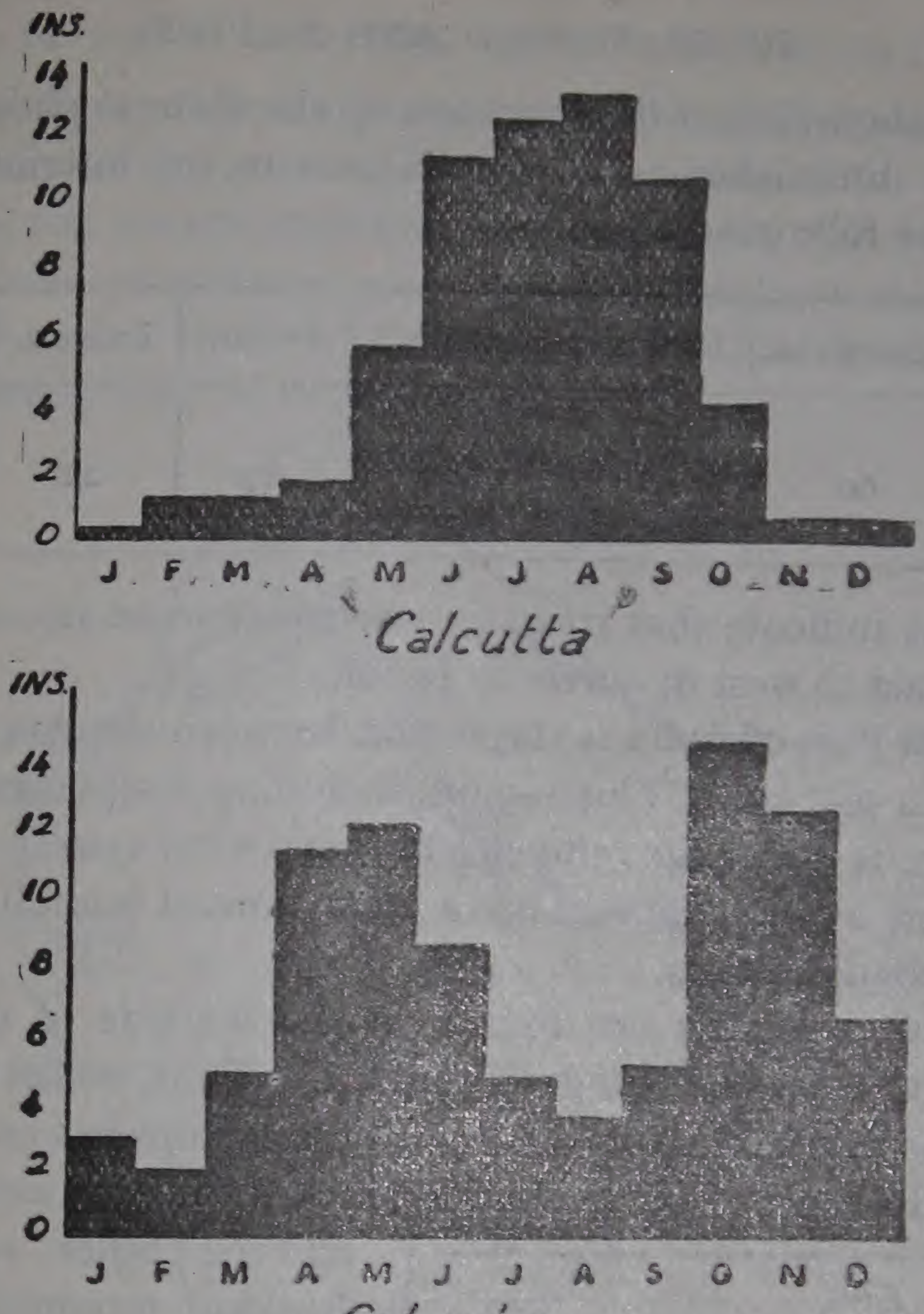


FIG. 171.—DIAGRAMS SHOWING MEAN MONTHLY RAINFALL AT CALCUTTA AND AT COLOMBO.

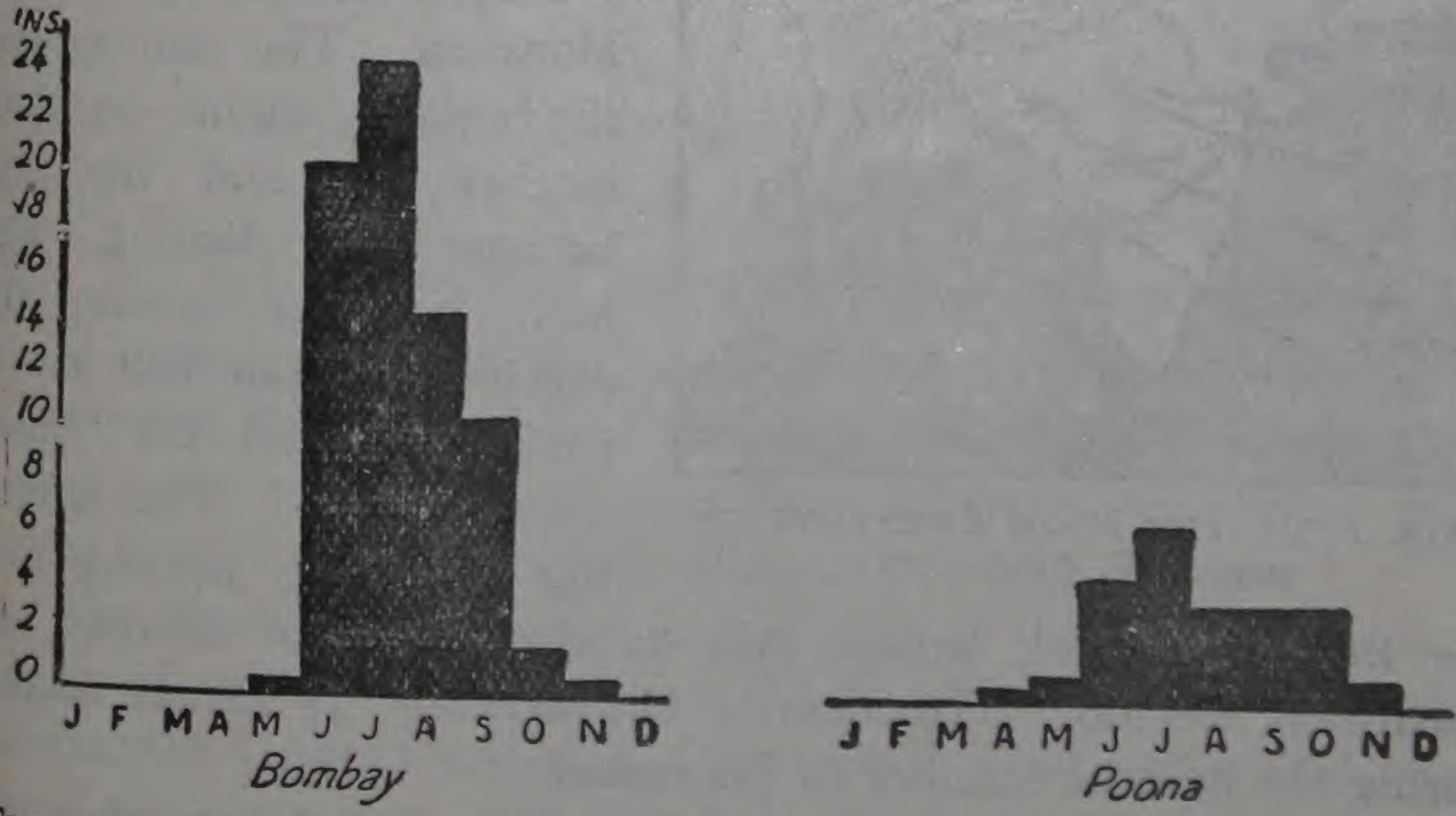


FIG. 172.—DIAGRAM SHOWING THE INFLUENCE OF A MOUNTAIN BARRIER UPON THE DISTRIBUTION OF RAINFALL.

Poona is in a "rain-shadow" region.

The Himalaya deflect the monsoon up the Ganges plain, but rainfall steadily diminishes as the winds pass to the interior. This is shown by the following list.

Place.	Calcutta.	Patna.	Allahabad.	Delhi.	Lahore.	Peshawar.
Mean Annual Rainfall	60	44	39	27	21	13

Such figures indicate that irrigation becomes more necessary as we pass from east to west in northern India.

The **driest part of India** is the region between the Aravalli Range and the Iran plateau. This region, including Rajputana, Sind and Baluchistan, is under the influence of a dry wind system at all times (refer to page 274). Karachi has a mean annual rainfall of 8 inches, and Jacobabad 4 inches.

Rain-shadow regions are found on the lee side of the Western Ghats and the Arakan Range of Burma. Thus, whilst Calicut has 66 inches of rainfall in June and July, Bangalore has only 7 inches. Akyab on the coast of Burma has 193 inches per year, and Mandalay on the other side of the Arakan mountains has 38 inches. (See also Fig. 172).

FIG. 173.—THE MAIN CURRENTS OF THE S.W. MONSOON.

Season of the Retreating Monsoon. The sun crosses the equator again on September 23, and his rays become more slanting. The land becomes cooler, the south-east trade belt moves southward, and the "monsoon retreats." The retreating monsoon, passing over the Bay of Bengal, brings rain to the shores of Madras and north-east Ceylon. Trincomalee has actually 37 inches rainfall during the months October to December.

When the clouds disappear uninterrupted sunshine raises the temperature over India for a short time. But the effect of the

increasing slant of the sun's rays is soon felt. The weather becomes cooler, and the dry north-east monsoon sets in.

During this season cyclones often develop in the Bay of Bengal. They travel—sometimes across the peninsula, sometimes to the Ganges basin or Burma. Madras, Bengal and Burma frequently suffer severely from such storms.

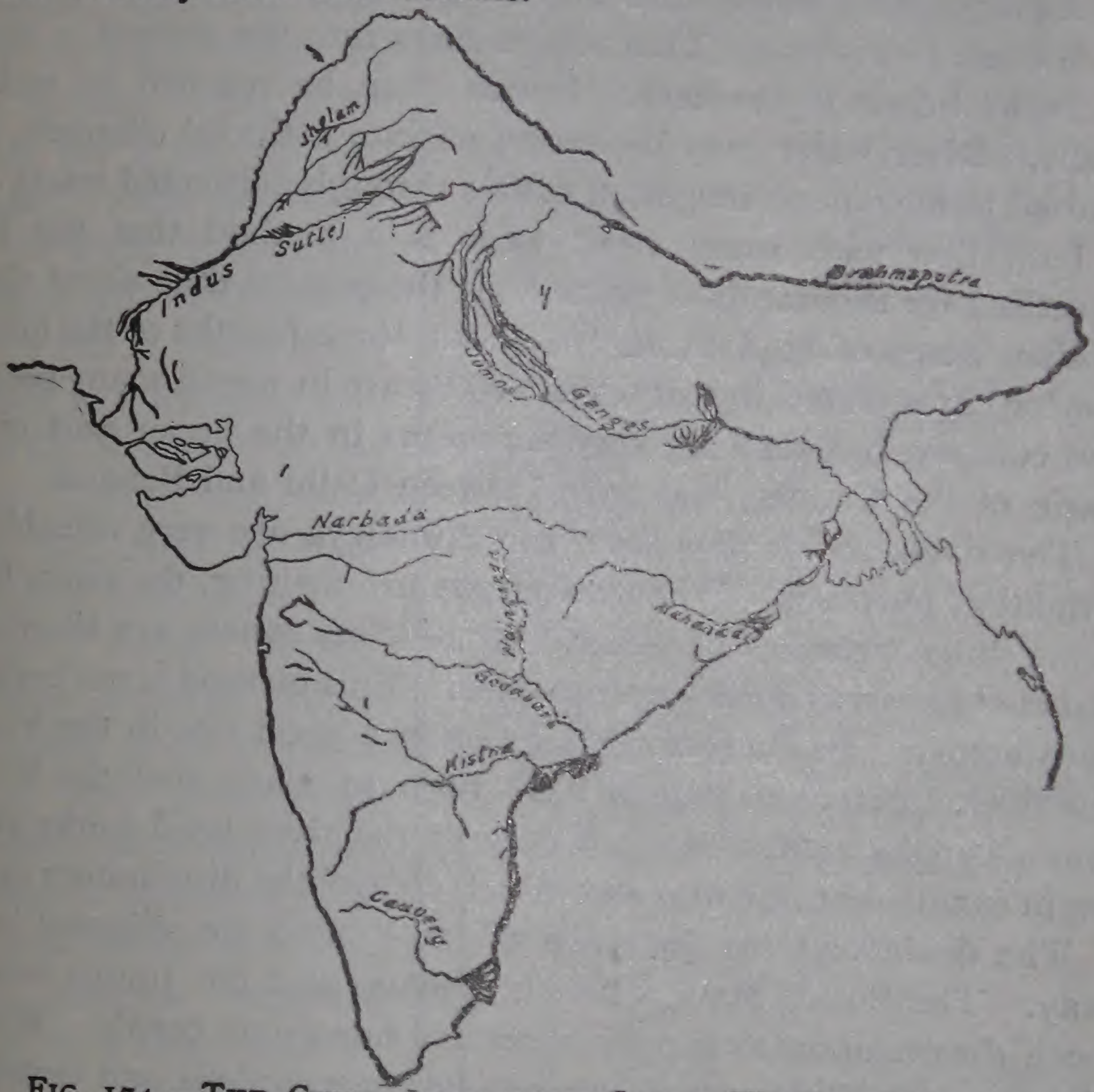


FIG. 174.—THE CHIEF IRRIGATION CANAL WORKS OF INDIA.

In order that plants may grow there must be water in the soil. The water dissolves mineral matter, so forming a food which roots can absorb. If there is no water there will be no vegetation. Where there is no vegetation neither animals nor men can live.

The figures given in the earlier part of this chapter show that parts of India have deficient rainfall. Most of the basin of the Indus, the Upper Ganges, and the rain-shadow region of the peninsula, do not receive sufficient rain for the growing of crops. In some areas, of which Madras is one, rainfall is uncertain, varying

from year to year. The land must therefore be watered in other ways. Man makes good nature's deficiencies by **irrigation.** The construction of irrigation works has made real famine a thing of the past in most parts of India.

Water falls upon the earth in the form of rain or snow. Some of it evaporates ; some sinks into the ground ; some is carried back to the sea by rivers. That which sinks into the ground is stored in rocks below the surface. It can often be reached by sinking **wells.** River water may be drawn off into artificial channels, and caused to flow along **irrigation canals** through cultivated tracts.

Irrigation with water from wells is a method that has been practised for thousands of years. At the present time about eleven million acres of land in India (about three-fourths of the area of Ceylon) are treated in this way. Wells are in use in many parts of the country, but they are very numerous in the upper part of the basin of the Ganges, especially between Delhi and Benares.

The rivers which flow from the Himalaya are very valuable for irrigation purposes. When the snows are melting, the rivers bring down huge volumes of water. **Inundation canals** are those constructed to carry off the surplus water. This method is not perfectly satisfactory. Its success depends upon a good rise in the level of the river. **Perennial canals** have been so made that the flow of water can be controlled—not only at the river head-works of the main canal—but also at points which control the distributory canals.

The doabs between the rivers of the Punjab are irrigated in this way. The Sutlej, Ravi, Chenab, Jhelum and the Jumna have all been drawn upon to supply water for numerous canals. What is the result? What was desert has become gardens and cornfields. The Punjab has been converted into one of the important agricultural regions of the country. Land which produced nothing of value now has a surplus of food for export. Increasing the food-producing power of the land has increased its population. New colonies, such as the area around Lyallpur, have been established in what were formerly unpeopled crown wastes.

The work is not yet complete. **The Sutlej Valley Irrigation Scheme** is now being carried out. This will irrigate a large area south-west of Ferozepore. Three barrages on the Sutlej and one on the Panjnad will feed irrigation canals. This work will affect the

volume of the lower Indus. Hence another scheme is required for the benefit of Sind. This is known as the Sukkur Barrage Irrigation Project. It was opened in 1932.

A great barrage has been built across the Indus near Sukkur. During times of flood the river will flow through gates in the barrage. At other times the gates will be closed. Thus the level of the water behind the barrage will be increased by 15 feet. Three large canals on each side irrigate Eastern and Western Sind. These and their branches have a total length of 7000 miles.

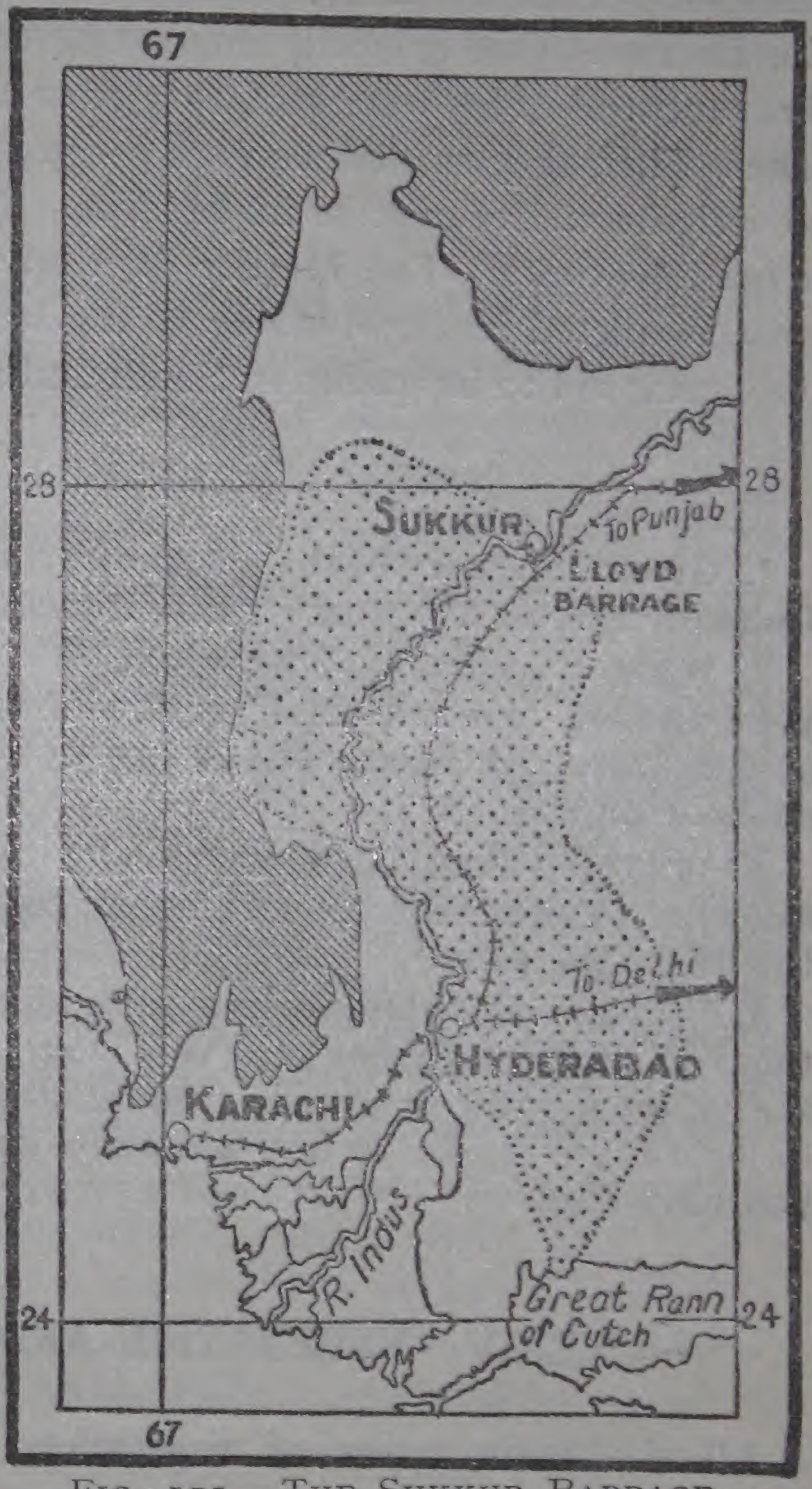


FIG. 175.—THE SUKKUR BARRAGE.

The **Sarda Canals Scheme** (opened 1928) comprises 4000 miles of canal and distributing channels, connected with a barrage at Banbassa, near the west border of Nepal. The scheme supplies water to a large area in the U.P., already highly cultivated; but it will improve crops, remove risk of famine, and probably make this region the chief sugar-producing part of India.

Perennial canals have been constructed to serve the deltas of the Deccan rivers and the upper part of the Ganges basin. In Bengal, Northern Bihar, and the lower part of the United Provinces they are not required. But the doab between the Jumna and the Ganges is irrigated from the Ganges, and Southern Bihar is irrigated from the Son.

The Deccan plateau has few irrigation canals. The valleys of the regions are irrigated by means of tanks. These are storage reservoirs, village tanks or lakes made by damming valleys. Large numbers of tanks are to be seen in most of the valleys of the Deccan. One specially interesting case is the Periyar river of Travancore. The waters of this river are stored in an artificial lake. Then they are led through a tunnel in the Cardamom Hills, to irrigate a dry region in Madras. Madras has 35,000 small irrigation works. The Mettier dam on the Cauvery river, which was completed in 1934, is one of the largest in the world and an important aid to irrigation in South India.

EXERCISES

1. Give a summary of the seasons into which the year is divided in India, describing the weather conditions of each.

2. What is meant by a "cyclone"? Make a sketch to illustrate your answer, marking the direction of the winds in different parts of the area. At what periods are cyclones likely to travel over parts of India?

3. What is a "rain-shadow region"? Name such regions in India; say what produces the special climatic conditions and how they affect the life of the people.

4. Why are irrigation works required in some parts of India? Show those portions of the country in a sketch map. Give particulars of the various methods of irrigation, and say in which areas they are in operation. Refer to any specially important schemes of which you have read.

XXXIV. VEGETATION AND ANIMAL LIFE

All the main types of vegetation region—forest, grassland, scrub-land and desert—are represented in India. Each is characterised by its special forms of animal life. The distribution of these types is as follows:

FORESTS

Luxuriant forests are found in areas which have heavy rainfall —the Himalaya, Assam, Western Ghats and Ceylon. Smaller and less luxuriant forests occur in the drier regions of the central

plateau and valleys of the Deccan. Dry forest, consisting largely of a species of acacia stunted in growth, is found in the still drier region of the Punjab. (Refer to Fig. 178.)

The tiger, leopard, chita, hyaena, lynx and other animals have their home in the forests. The tiger is often to be found on the borders of the hill pastures, to which cattle are driven in summer. Wild elephants are found in the dry forest of the central plateau, but their special home is the damp forest of Assam.

FIG. 176.—SCRUB-LAND, WITH THE BALUCHISTAN HILLS IN THE BACKGROUND.

GRASSLAND

Grassland occurs in regions of low rainfall, and on the higher parts of mountains. Wide stretches of grassland or steppe are found on the central plateau, and on the high land between the Deccan rivers. Wild buffaloes have their home in this region, and on high ground there is the Indian bison. Patches of grassland also occur at intervals in the Himalaya forest, and on the higher slopes above the forest belt. Wolves are common in the latter region : they prey upon sheep.

SCRUB-LAND AND DESERT

Scrub is the vegetation of regions with deficient rainfall. Where rain seldom or never falls the land is desert. The Thar Desert, with a border of scrub-land, lies between the Indus and the Luni river. Scrub-land also occurs on parts of the high land of the peninsula. It is the home of the wild pig, which is very destructive to crops of rice and sugar-cane.

Amongst other Indian animals are the antelope, civet cat, mongoose, musk-rat, etc., in the lowlands, and the bear, ibex, wild sheep and goat on the Himalaya. Small herds of antelope are to be seen in the fields in all parts of the peninsula, and larger herds are in the shelter of the bush on the borders of cultivated areas. The mongoose and musk-rat are useful animals amongst human habitations, the one because of its skill in catching and killing snakes, and the other because of its unceasing war upon cockroaches.

The crocodile is found in the rivers of the Indo-Gangetic plain and in the Mahanadi. Snakes are very numerous. There are nearly 300 species in India. The cobra is the typical snake, but in jungles the fierce python is often encountered.

The Forests and Forest Products. Before considering the forests in detail some reference should be made to the great plain. In that region all the available land is required for cultivation. There are of course plenty of trees, but no actual forest except the Terai jungle. In the western part a common tree is the **babul**, a species of acacia. It yields hard wood, used in making ploughs. Farther east, where rainfall is heavier, **bamboos** and **palms** take the place of babul, and the **mango** is grown almost everywhere, especially near villages. Other common trees are the **mahua** (Indian olive), and trees of the fig family, such as the **pipal** and **banyan**. Brown monkeys, which are very mischievous and destructive, and squirrels, have their home in the mango groves of the plain, and jackals roam about the fields in the morning and evening.

The forests of the Eastern Himalaya, Assam, and the Western Ghats are similar in character. But those of the Eastern Himalaya show greater variety, because of the greater range in altitude.

On the lower slopes of the Himalaya the forest is very luxuriant. Tall trees, bearing clusters of orchids on their branches, rise from a tangled undergrowth of grass, shrubs, tree-ferns and bamboos. Higher up the vegetation is not so luxuriant, but the forest belt extends to an altitude of 12,000 feet. Amongst the trees at lower levels are sal, khair, magnolia, and oaks. Above 9000 feet there are belts of coniferous trees—firs, pines and cedars—and higher still there are forests of deodars. Above these comes the belt famous for its rhododendrons, and then broad slopes clothed with grass.

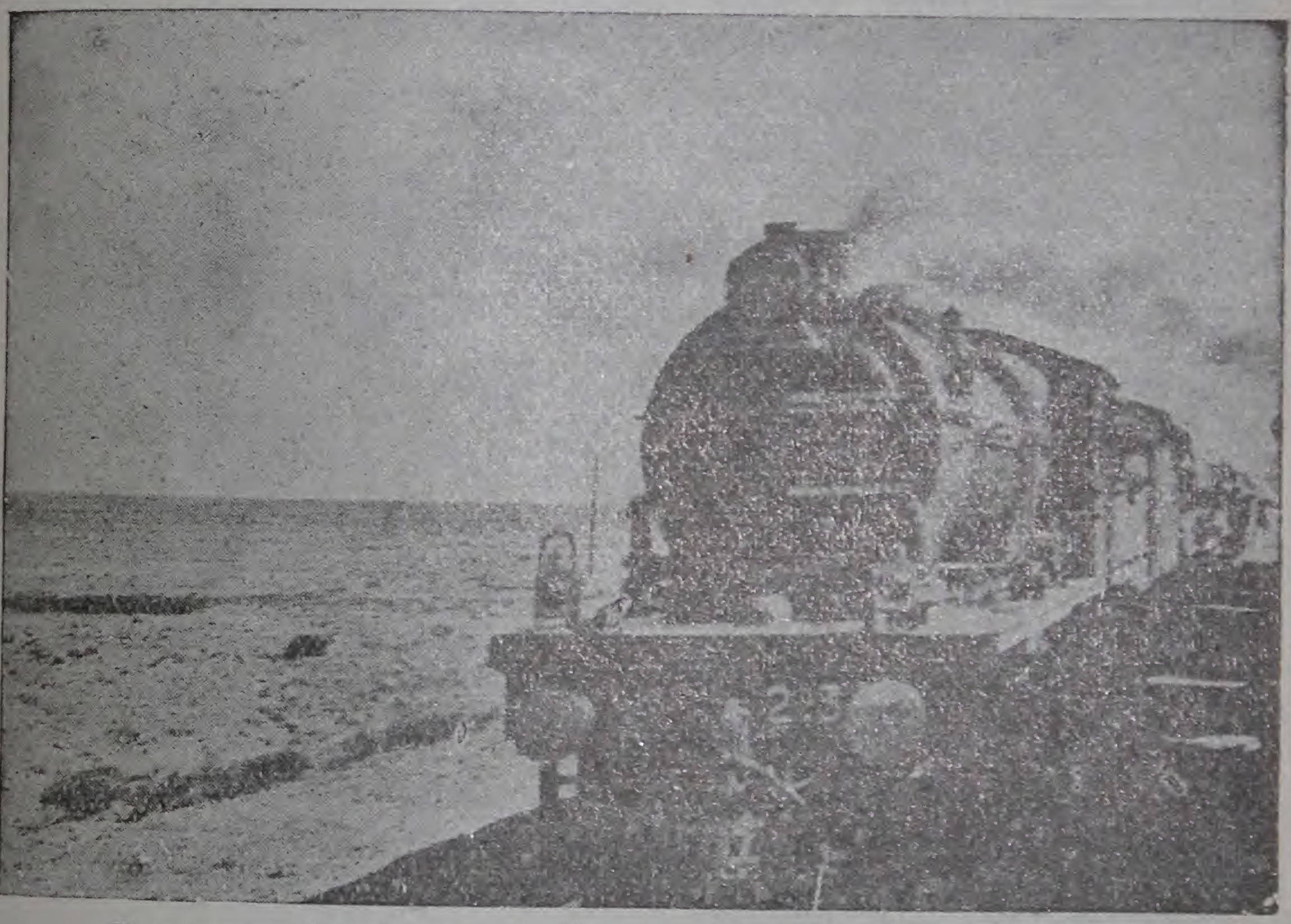


FIG. 177.—TRAIN CROSSING THE CENTRAL INDIA STEPPE.

Forest products are of great value. Amongst them are **hard** woods from sal and teak, **soft woods** from pines and cedars, and ornamental woods such as ebony and rosewood. Resin is obtained from the **pine forests** of the north-west Himalayas. The **khair**, a species of **acacia** that grows in the Himalaya and Burma, yields wood from which **catechu or cutch** is extracted. This substance is used in dyeing. What is known as **Borneo cutch** is obtained from mangroves which grow in the Sundarbans. The bamboo and coconut palm provide materials for a multitude of purposes (refer to page 148).

Cinchona, from the bark of which quinine is made, is grown near Darjeeling and in the Nilgiris (see page 138). The Australian **eucalyptus and wattle** have been introduced into the high plateau of southern India, and they grow remarkably well.

Teak flourishes in a warm wet climate, such as that of the Western Ghats and Assam, but it is also found in the Central

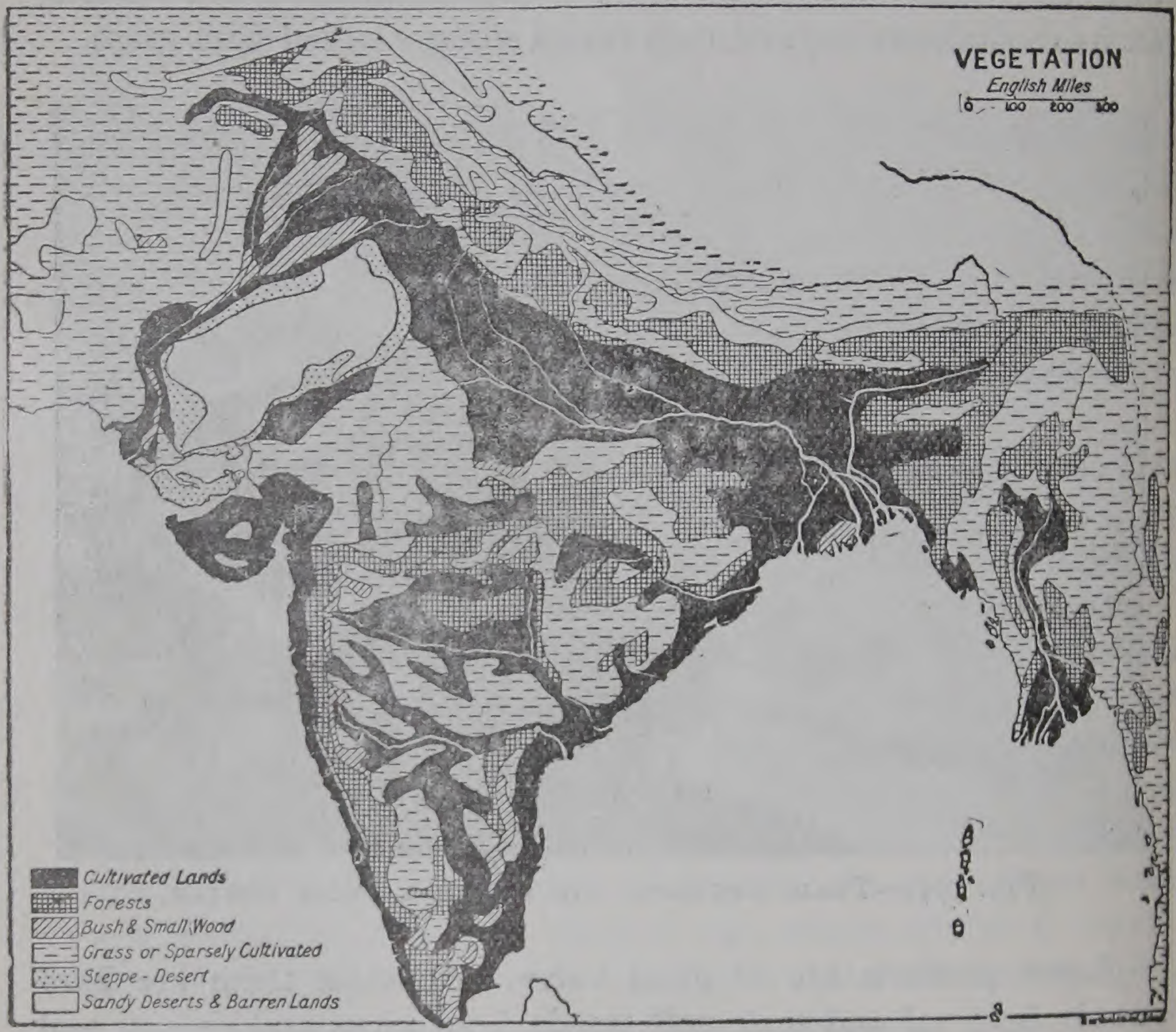


FIG. 178.—NATURAL VEGETATION OF INDIA.

Provinces. The timber is valuable because it is hard, durable ant-proof, and contains oil which protects nails and bolts driven into it from rust. It has therefore been much used in shipbuilding. When the wood is full of sap it is heavier than water. Hence the tree must be killed before logs can be floated down rivers. This is done by cutting off large rings of bark. The chief teak port is Calicut on the Malabar coast.

FIG. 179.—THE SUNDARBANS.

By courtesy of Sir S. Eardley-Wilmot.

Sal provides a hard, dark brown timber. It is coarse-grained, very durable, and much used, after treatment, as railway sleepers. The tree grows well in regions with moderate rainfall, but it is found in the forests of the Eastern Himalayas. There are large sal forests in the northern part of the peninsula—in the central plateau and on the Eastern Ghats as far as the Godavari valley. The sal forests do not extend south of the Godavari, but in that region there is **satin-wood, sandal-wood,** eucalyptus, and in the wetter regions teak.

Ebony yields hard wood which takes a fine polish. There are three varieties, black, red, and green. The blackest and most valuable grows in the warm, wet regions of the Western Ghats and Ceylon.

The coconut palm likes a warm, moist climate, and it grows best in sandy soil near the sea. Coconut palms are a special feature of Ceylon, and they are grown along the Malabar coast. In both these regions coconut oil is used in the manufacture of soap, in which perfumed oils from other trees and shrubs are used.

As time goes on India will probably draw more largely upon her stock of timber in the coniferous belt of the Himalaya. This timber is very useful for pit-props, telegraph and telephone poles, and building purposes, and it is a valuable source of resin and turpentine. Some varieties are very suitable for pulping for the manufacture of paper, and the wood is also useful for the making of matches. Such industries are making fair progress—paper-making at Lucknow, and the preparation of resin at Bareilly—but their output is rather small.

EXERCISES

1. Draw a map of India. Shade the areas where the most important forests exist. Write on each area the name of the chief timbers it yields. Shade in a different way the regions of scrub-land and desert.

2. Name trees grown in India that yield (*a*) hard, useful timber, (*b*) ornamental timber, (*c*) substances of value for medicinal purposes, (*d*) useful fibre, and say where they are grown.

XXXV. THE PEOPLES OF INDIA

The population of India, almost 338 millions in number, includes people of many different types. This is due to invasions of the country by various tribes in bygone times. The original inhabitants were the **Dravidians.** Invaders who settled in the north mingled with these people, so producing fresh types. The Dravidians of the south were less disturbed, being protected by the nature of the land.

The term **Dravidian** is applied to groups of people who speak Tamil, Telugu, or a language connected with these. Dravidian peoples occupy nearly the whole of India south of the Vindhya Range, except the south of Bombay Presidency. Tamils are found mainly in the south of Madras Presidency and the north of Ceylon. Large numbers have emigrated to Assam, the Malay Peninsula, the West Indies and other lands, where they find work on plantations. The Telugu region includes much of the north of Madras and part of the Nizam's dominions. On the Malabar coast are Dravidians who speak Malayalam, and in Mysore, in the south-west of the Nizam's dominions and on the coast round Mangalore there is the Kanarese section.

Dravidian tribes found in the forests of the plateau of central India have made much less progress than the rest. They are the most primitive people in India—only semi-civilised. In their forest home they have been cut off from contact with progressive peoples.

Both the white race and the yellow race have invaded India at various times. The mixture of these races with the aboriginals produced types of people with skins of varying colour, seen in different parts of India at the present day.

Mongolians advanced into the country, *mainly* from the east. Traces of these invaders are to be seen in the people of Burma, Assam, and Nepal—in the colour of the skin, and the angle at which the eyes are set. In Bengal there is evidence of mixture of the Mongolian and Dravidian peoples.

The white people, who probably lived on the steppes of Asia 4000 years ago, invaded many lands. Some went into Europe, others settled on the Iran plateau (Persia), and some entered India by the passes on the north-west frontier. These people are called

the Indo-Aryan people, after the name of the group of languages they speak. Later on, some of the Persians were driven from their home by religious persecution. They took refuge in India. Their descendants are the Parsees, mainly settled in Bombay, and numbering over 97,000.

The first white people who entered India settled on the banks

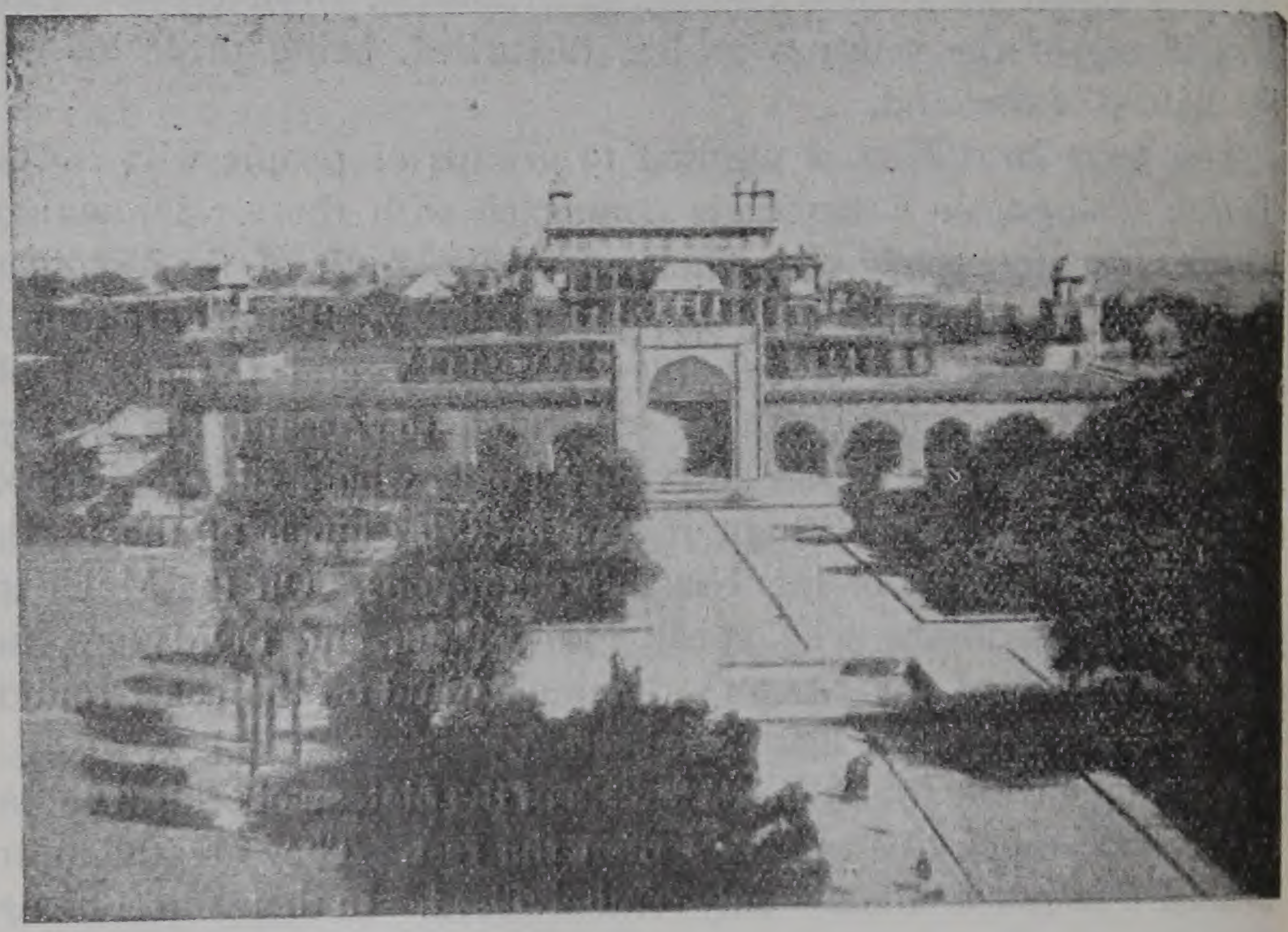


FIG. 180.—AKBAR'S TOMB, SIKANDRA, NEAR AGRA.

of the Indus ("Sindhu" = the river), from which the country is named. Centuries later, further influxes of white people drove them farther into the interior. They travelled by the great natural route—the low divide between the Thar and the Himalaya—into the Ganges basin. Then they spread southward to the Vindhya Range. Some turned down the Luni valley and reached the shores of the Arabian Sea. The Indo-Aryan element is therefore most strongly marked in the people of the Punjab. The Ganges basin shows a mixture of the Indo-Aryan and Dravidian types.

Long afterwards, nomadic horsemen of the steppes swept through the north-west passes and down the Indus. Afterwards they probably moved to the Deccan. They are supposed to be the ancestors of the Mahrattas.

About 1000 years ago a Turkish chief founded a small kingdom

at Ghazni on the Afghan plateau. From this centre armies swooped down the passes. They stormed the cities of the great plain, introduced Muhammadanism, and drove Hindu chieftains southward. Then a famous Moghul leader, Babar, who had conquered Central Asia, descended upon India in 1526, and founded an empire which lasted about 180 years. When Europeans appeared upon the scene it was beginning to decline.

FIG. 181.—SKETCH MAP SHOWING THE ROUTES INTO THE INDUS PLAIN AND THE GATEWAYS BETWEEN THE HIMALAYA AND THE ARAVALLI.

Akbar, the greatest of the Moghul emperors, held the whole of the land north of the Satpuras, but he never completely conquered the Deccan. After him came Shah Jehan, famous as builder of fine mosques at Delhi and of the beautiful Taj Mahal at Agra.

The Mahrattas helped to break Moghul power in India. At one time they seemed likely to form a new empire. But the destruction of the Moghul empire left the north-west passes open to invaders

again. A Persian army ravaged the Punjab and plundered the city of Delhi. Then an Afghan army swept down into the plain and broke up the Mahratta forces at Panipat. The Mahrattas retreated to the Deccan. Later on they opposed the British, but they did not become so powerful as they had been at the time of the break-up of the Moghul empire.

These brief references to the history of India are sufficient to show two things: (1) how the country got its mixed population, speaking many different languages, (2) the importance of those north-west passes as entrances to India.

Migrating peoples and invading armies must follow lowland routes. Highlands and waterless deserts are barriers to their advance. The Khyber Pass is the chief land entrance to the Punjab. From the Punjab to the Ganges plain there is a wide "natural gateway." This is the low land between the Himalaya on one side, the Aravalli Range and the Thar Desert on the other. It might be called the "Delhi gateway," after the capital city which stands in the middle of it. Delhi was made the Moghul headquarters because of its commanding position. It was at Panipat, 50 miles north of Delhi, that Babar slew the Delhi sultan in 1526, and Akbar defeated the Afghans who had driven out the Moghuls. These battles were struggles between opposing forces for the possession of the gateway.

Delhi has never lost its importance, though Calcutta was for some time the capital of British India.

India has always attracted traders from other lands. It was during the reign of Akbar the Great that Europeans began to establish trading colonies in India. The Portuguese discovered the sea route round Cape of Good Hope in 1497. They were followed to India by the French and the British. Before the end of the eighteenth century the Moghul empire had begun to break up, and British influence became predominant.

The Portuguese still hold Goa on the Malabar coast, Daman near Bombay, and the small island Diu, 140 miles from Daman. The French have possessions on the Malabar and the Coromandel coast and on the Bay of Bengal. The French colonies are divided into five dependencies: Pondicherry, Karikal, Chandernagor Mahe and Yanam. The administration is in the hand

Governor, and there is a General Elective Council. The colonies send representatives to the French parliament in Paris.

The British Indian Empire was built on the ruins of the Moghul Empire. After the Revolt of 1858 the government of India was transferred from the East India Company to the Crown and Parliament of Great Britain. The office of the Secretary of State for India was created and the holder of this office made responsible for the administration of the country. India was divided into provinces and states under the supreme authority of the Governor-General in Council. Since the formation of the Indian National Congress in 1885 Indians have been demanding and obtaining an increasing share in the government of their own country.

At present the government is in a state of transition. In 1935 the new Government of India Act was passed and this act proposes to make India a federal country consisting of the self-governing provinces of British India and the Indian States.

On 1 April 1937 the following provinces—Madras, Bombay, Bengal, the United Provinces, the Punjab, Bihar, the Central Provinces, Berar, Assam, the North-West Frontier Province, Orissa and Sind—became autonomous. In these provinces the government is entrusted to elected responsible ministers who are answerable to the Legislature, which is elected, for their policy. Besides these provinces there are in India about 700 Indian States and Agencies. In the larger states, such as Hyderabad, Mysore, Baroda, and Gwalior, the Government of India is represented by a Resident and in the smaller states by an Agent.

In the management of their internal affairs the Indian rulers have very great liberty. But their relations with foreign powers and other states and their armaments are controlled by Great Britain.

Distribution of Population. India is an agricultural country, and population is therefore most dense in the areas where food is most easily grown. Food production depends upon soil and water. Hence the well-peopled regions are those with good soil and abundant supplies of water from rain or irrigation works.

The **densely peopled areas** are: (1) the alluvial plain of the Ganges, where rainfall is generally sufficient; (2) the Punjab, where extensive tracts are under irrigation; (3) the west coast

plain, which receives abundant rainfall; (4) the east coast plain, which is watered partly by rain and partly by irrigation works. In all these areas there are about 400 people to the square mile (*Oxford School Atlas*, p. 4).

Population is particularly dense near the lower Ganges and in that part of the plain between the main river and the Himalaya foot-hills. Here the density is more than 500 per square mile. This is, of course, the most productive land in India. But the extra density of population is partly due to the fact that the river itself and the cities on its banks attract people, and partly to the fact that the Ganges plain is the great highway of northern India. Population always concentrates on the natural routes of a country.

India has also some **thinly peopled areas.** These are regions where the land has low food-producing power, because the soil is thin or poor, or water is scarce, or the land is covered with unhealthy forest and swamp. Examples are: (1) the Thar desert, where settled life is possible only in oasis towns, such as Bikaner; (2) portions of Sind not yet irrigated; (3) the dry barren plateau of Baluchistan; (4) the higher rocky slopes of the Himalaya; (5) the forests and swamps of the Terai and the Sundarbans; (6) the forested hills of Assam.

The rest of India, consisting of the undulating plateau south of the great plain, is fairly well peopled. In two parts of this region the population might be described as dense. These two parts are Hyderabad and the middle of the Central Provinces.

EXERCISES

1. Draw an outline of India. Shade the areas which have a dense population and those which have a sparse population; write explanatory notes.

2. Referring to the types of people in different parts of India, show that early settlers must have come into the country through the mountain passes.

XXXVI. SURVEY OF THE PROVINCES AND STATES

A good physical map of India will be required when reading this section. Comparisons between physical and political maps and those of climate and vegetation should be made where possible. The student is advised to pay particular attention to the sketch maps which accompany the text.

THE MOUNTAIN STATES

In the north rise the massive walls of Himalaya. High up amongst the jagged ridges are the mountain states. They contain some of the most beautiful scenery in the world and will, in years to come, attract many mountaineers. Even now the number of expeditions which come to India, in order to climb one of the famous mountains, increase in number, yearly. Mount Everest has attracted great attention and a number of highly organised parties have tried up to date, without success, to conquer the highest peak in the world.

Kashmir, one of the states, extends northwards beyond both the Himalayan ridges and the Karakorams. Near the middle of the country is the deep and crooked valley of the upper Indus. The river Gilgit comes through a rocky valley in the north-west corner to join the Indus. Farther south lies the Vale of Kashmir, through which flows the Jhelum, forming Lake Wular and some smaller lakes. The Chenab has cut a deep valley in the south-west corner.

Kashmir has therefore a most irregular surface. Deep cultivated valleys lie between snow-capped mountain ridges. But the people have carried cultivation up the mountain sides. Terraces cut in steep slopes are watered by streams from melting snows and made to yield grain and fruit. Sheep and goats are grazed on land which will not allow of cultivation.

Kashmir is noted for its art industries—wood-carving, metal-work, the making of shawls, and the jewellery, embroidery and papier mâché industries. Srinagar, the capital, produces a large number of papier mâché articles—trays, plates, boxes, etc. The town is

in the Vale of Kashmir, at the meeting-place of routes from Tibet and the Punjab.

Sikkim, and the **independent states, Nepal and Bhutan**, lie farther east. They are mountain regions, but Nepal and Bhutan stretch down to the great plain. Much of the low-lying portion of Nepal is covered with Terai jungle.

In one respect at least these states are like Kashmir. The mountain sides are terraced, so that they look like a huge staircase. On each step or terrace there are fields of rice, and sometimes jute. Nepal has even rice and jute to spare for export to India. This state is inhabited by Gurkhas. They are people of Rajput origin, whose ancestors were driven to the mountains by an invasion of India from the north-west. The Gurkhas volunteer in considerable numbers for service in the Indian army; they make soldiers of a very fine type.

Looking away into the west we see the **North-west Frontier Province**. It consists mainly of mountain spurs, and deep valleys cut back into the plateau. The only highways are those made by the British. Village roads are mere tracks, winding through rocky valleys and over bare hills.

Grain, vegetables and tobacco are grown in alluvial strips beside rivers and on terraced hillsides. The Swat valley is perhaps the best cultivated. The lower part is irrigated for rice; the upper part produces excellent fruits, and the mountain sides above it are clothed with forests of pine and deodar. But the province is more suited to pastoral work than agriculture. The Wazirs breed good horses; the Afridis have large herds of cattle, sheep and goats, and they breed mules and donkeys.

This rugged region has produced many hardy and warlike peoples who love to raid the dwellers in the plains. The Wazirs, Afridis, Hunzas and other north-west tribes have been a menace to prosperity in the region for centuries. The towns of the province are trading stations and caravan centres. The chief are Peshawar, Bannu, and Dera Ismail Khan, situated where roads come down from the passes into the plain. This situation makes them useful centres for frontier defence.

Following the edge of the plateau southwards, we see the high, stony, dry region of **Baluchistan**. It is reached from the plain by an important route past Jacobabad and up the Bolan Pass—the

"Western Gate of India." Twenty miles beyond the pass stands Quetta, the fortress that defends the gateway. Pastoral work and a little agriculture find employment for the people. They trade mainly with Afghanistan and Persia.

THE GREAT PLAIN

A low watershed lies a little west of Delhi. It stretches northwards from the Aravalli Hills, dividing the great plain into two parts.

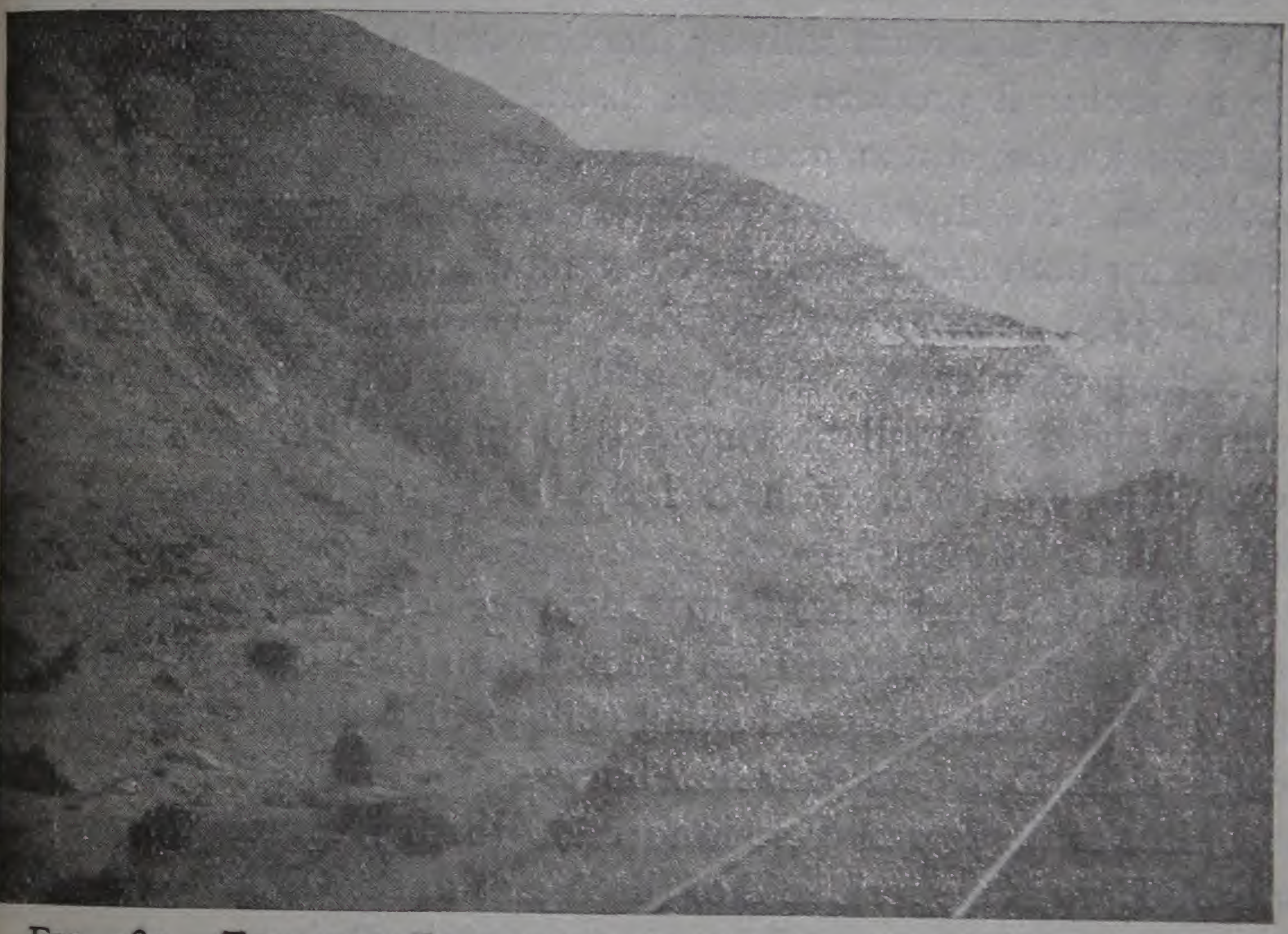


FIG. 182.—TOWARDS BALUCHISTAN THROUGH THE WESTERN GATE OF INDIA (THE BOLAN PASS).

On one side there is the Punjab and Rajputana. On the other side lie the United Provinces, Bihar, Orissa, and Bengal.

The Punjab stretches eastward as far as the Jumna. Its north-east corner goes into the Himalayas, beyond Simla and Mandi. In the north-west corner there is the Salt Range, between the Jhelum and Sohan rivers. Apart from these small areas the Punjab is an almost level, treeless plain. It is bare and brown when there are no crops in the fields. But it is crossed by five rivers and innumerable irrigation canals. Nature made the Punjab a desert. Man has made it a great agricultural region. Three-fourths of the people

are engaged in farming, but there are skilled craftsmen here, as in other parts of India.

Wood-carving is a favourite occupation, especially in Lahore, Jhelum and Amritsar. There are several thousand silk weavers in Amritsar, and many people in the city are engaged in making carpets. Amritsar (Amrita Turas = Pool of Immortality) is the chief Sikh centre. There are several Sikh states in the eastern part of the Punjab, the chief being Patiala and Nabha.

The Punjab towns—Lahore, Amritsar, Multan and others—owe their growth to the convenience of their situation for trading. Lahore is an important railway junction and a collecting centre for the agricultural produce of the district. Some of its people are engaged in the cotton manufacture, others in oil mills, chemical works, and North-western railway workshops. Simla is the hill-station for both Delhi and the Government of the Punjab.

The good geographical position of Delhi was described in the preceding chapter. The city and a small area round it now form a separate small province. Still another "New Delhi" has come into existence, with a large block of buildings for the Imperial Government.

South of the Punjab lies **Rajputana**, much of which is desert. The Rajput tribes were driven from the northern plain centuries ago. In the wilderness they formed small states; they built fortresses and walled cities to defend their new home against further invasion. In the midst of the region there is a small British province, Ajmer Merwara. Here is the residence of the Agent to the Governor-General. He acts as adviser to the eighteen states of the Rajputana Agency.

The plain of Rajputana is broken by the Aravalli Hills. Along the western side of the range flows the river Luni. This river varies greatly according to the season. When it floods the land the people of Jodhpur are able to raise fine crops of barley, wheat and millet.

Beyond the Luni valley the land stretches away westwards into Jaisalmer and Bikaner. It is little more than a waste of sand dunes. Here and there are oases, in which there are villages and cultivated fields. Many villages are supplied with water from wells 200 or 300 feet deep. The steppe-land bordering the desert is used for pastoral work, especially for the rearing of horses, ponies and camels.

The eastern part of Rajputana is altogether different. Many

streams flow from the Aravalli to join the Chambal. Rivers, and an annual rainfall of about 25 inches, make it a good agricultural region. The chief crops are millet, oil-seeds and wheat.

Some of the Rajput capitals are very interesting. Udaipur, in the Aravalli Hills, is a city of white marble palaces beside a chain of glistening lakes, round which grow palms and plantains. Around it stretches a bare brown expanse of hill country.

The " rose-red city " of Jaipur was founded by Jai Singh to take the place of the interesting old hill capital, Amber. This Rajput king also constructed a huge dam of white marble, which, by imprisoning a stream, formed one of the largest artificial lakes in the world. Jaipur is a city of wide, straight avenues and streets, flanked by rather low pink buildings. It stands on the plain at the foot of the Aravalli, not far from Lake Sambhar. Jaipur has a flourishing banking business and many art industries.

Crossing the Jumna from the Punjab we enter the **United Provinces of Agra and Oudh.** These extend far down the plain of the Ganges, ending in a wedge-shaped piece of land between the Ganges and the Gogra. The southern boundary is not far from the plateau of Central India. But when we search for the northern boundary we go beyond the Terai, and the Siwalik Hills, far into the Himalayas. The north-east corner of U.P. is not far, on the map, from the Manasarowar Lakes.

The United Provinces therefore consist of two regions. One is a mountainous area, intersected everywhere by valleys, and containing many lofty peaks; Nanda Devi is 25,600 feet high. The other region is a broad plain, built up of thick beds of sediment, and crossed by many rivers.

The valleys of the mountain region are fit for cultivation. Hence there are lines of towns and villages stretching into the Himalayas. The chief towns in this region are the hill-stations Naini Tal and Mussoori, and the sacred town of Hardwar, situated where the Ganges leaves the mountains.

The U.P. plain is one of the chief food-producing areas in India. The Jumna, Ganges and other rivers provide water for irrigation canals, and the region usually receives good rainfall during the monsoon season. Specially important crops are wheat and sugar-cane, but millet, rice, maize and pulses are also grown.

It is a region teeming with population. It has many cities, and villages without number. Though agriculture is a most important occupation, there are large numbers of craftsmen engaged in weaving, metal work and embroidery. Lucknow and Rampur produce gold and silver ware. Beautiful vessels of brass and copper are made at Benares, Moradabad and Lucknow; and Benares is a very important silk-weaving town. Cawnpore has become a busy industrial town, with special manufactures of woollen blankets, shawls, rugs, leather and cotton goods. Lucknow, the royal city of Oudh, has been called a city of palaces. Cawnpore is a city of factories and workshops.

Agra, on the Jumna, is best known to many people as a city of beautiful buildings, of which the Taj Mahal is most famous. But Agra also possesses cotton mills and factories for working in marble and stone. The city is also an important railway junction. Allahabad, the capital of the U.P., is an important educational centre. The city is well situated for trading purposes. It is a "confluence town", at the meeting-place of the Jumna and the Ganges, and it is a focus of roads and railways. A little lower down the Ganges there is Mirzapur, where woollen carpets are made. This town has also a special industry in the manufacture of shellac.

The province of **Bihar** lies between the United Provinces and Bengal. The northern part is a portion of the Ganges plain. It is crossed by the Gandak and other streams from the Himalayas and by the Son and other rivers from the plateau of Central India. The southern part consists of the eastern end of the Central India plateau (the uplands of Chota Nagpur) into which the Damodar river has cut its valley. The northern portion is a rich agricultural region with a dense population and a large number of towns and villages. It is part of the chief rice-growing region of India. Tobacco is grown near the Ganges and used in the great cigarette factory of Monghyr. Other crops include jute, oilseeds, sugar-cane and indigo. Patna, the capital, was once a centre for opium and is now a very important trading centre. As Patalipura it was a centre of learning in the reign of Ashoka. Bhagalpur and Ranchi produce textiles and lace. In the southern part there is a large coalfield in the Damodar valley, which is the chief coal-producing area in India, and Jharia is its centre. Iron ore is also

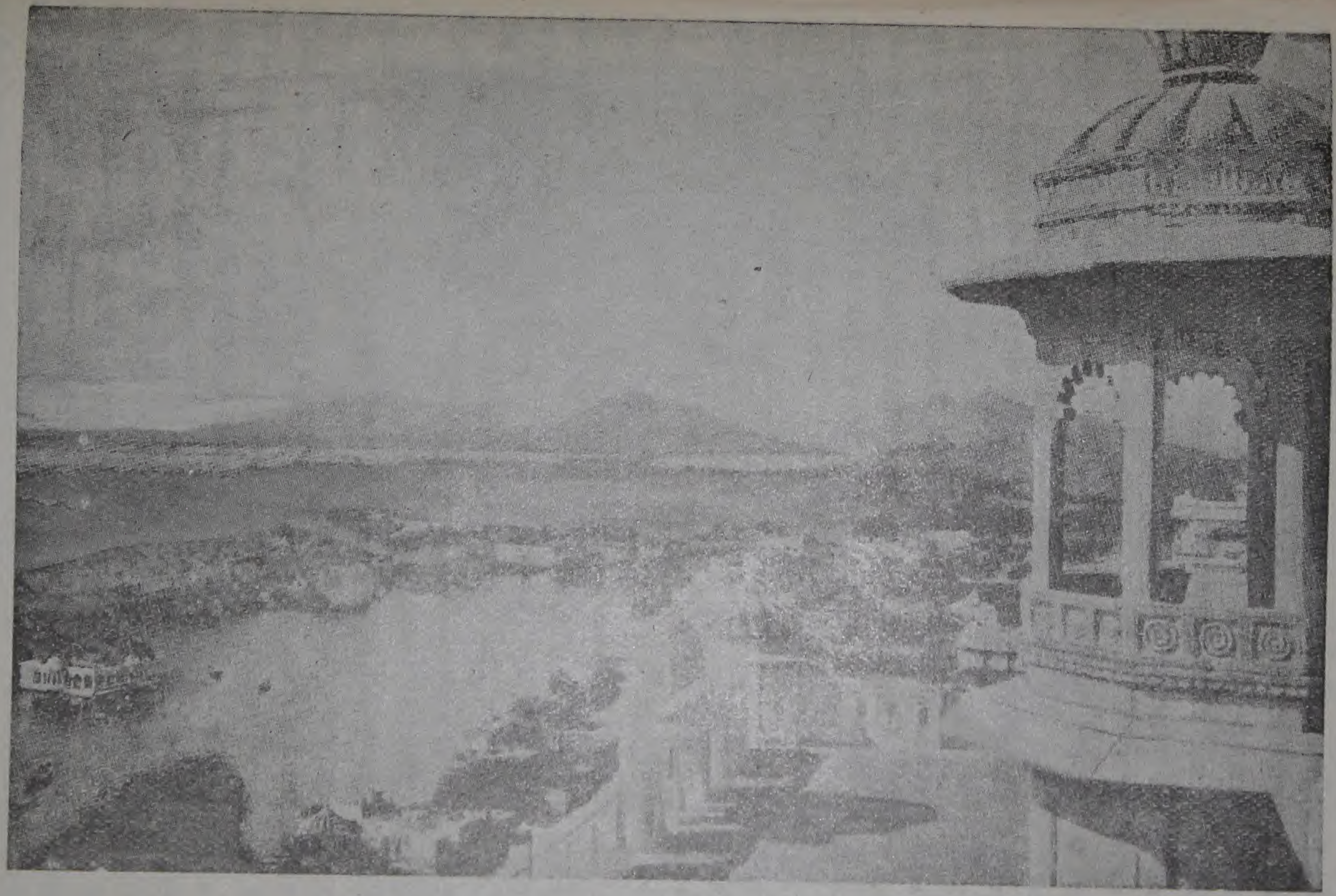


FIG. 183.—BIRD'S-EYE VIEW OF UDAIPUR.

mined in this valley. The presence of this mineral wealth led to the development of the great steel industry of Tatanagar.

The province of **Orissa** lies south of Bihar and includes a northern highland region and a southern lowland region which is formed by the valley of the Mahanadi and its delta. The south is an important agricultural area, rice being the chief crop of the delta. In the north, coal and iron ore are mined in the Mayurbhang district. The minerals mined in this region have helped to supply the needs of Tatanagar. Cuttack, the capital of the province, is a centre for metal work.

Bengal. The great plain becomes a little narrower below **Patna.** Then two hill ranges project towards each other, the Rajmahal on the west and the Garo on the east. Between them there is a gap, through which the Ganges and the Brahmaputra sweep southward towards the sea. As the rivers enter the gap they also enter Bengal.

Bengal is almost a triangle in shape. The base of the triangle is the Sundarbans—a network of waterways, small low islands and mangrove swamps. The apex of the triangle is in the Himalaya, thousands of feet above sea-level, on the border of Sikkim.

Bengal has a good deep soil, heavy rains during the monsoon, and inexhaustible supplies of water in the rivers at all seasons. It has many waterways, a dense population, and numberless towns and villages. The lowland region produces very large quantities of rice and jute, and smaller quantities of pulses, oil-seeds and sugar-cane. The upland region around Darjeeling is famous for its tea plantations.

The majority of the workers are engaged in agriculture, but many people are employed in rice mills, paper mills, jute factories, and in the manufacture of textiles. The Damodar valley coalfield extends into Bengal, and much coal is mined near Raniganj and Asansol. Most of the coal raised is used in India, but a certain amount is exported from Calcutta, chiefly to Ceylon and Malaya.

Calcutta, on the Hooghly, 80 miles from the open sea, is one of the chief ports in India. It commands the entrance to the great plain—the most thickly peopled part of the country. It is the outlet for the produce of agricultural and plantation regions. It is the inlet for manufactured articles, metal, machinery, etc., required by the inhabitants of the plain.

On the opposite bank is Howrah, connected with Calcutta by a bridge. Howrah has grown from a small village to a busy industrial town, with many jute mills and engineering works, in a hundred years. North of Calcutta there is a line of river ports on each bank of the Hooghly. Dacca is the most important place in eastern Bengal. It is a centre for the collection and export of jute, oil-seeds and hides.

Darjeeling is a health resort for residents of Bengal when the climate of the plains becomes too much for them. The East

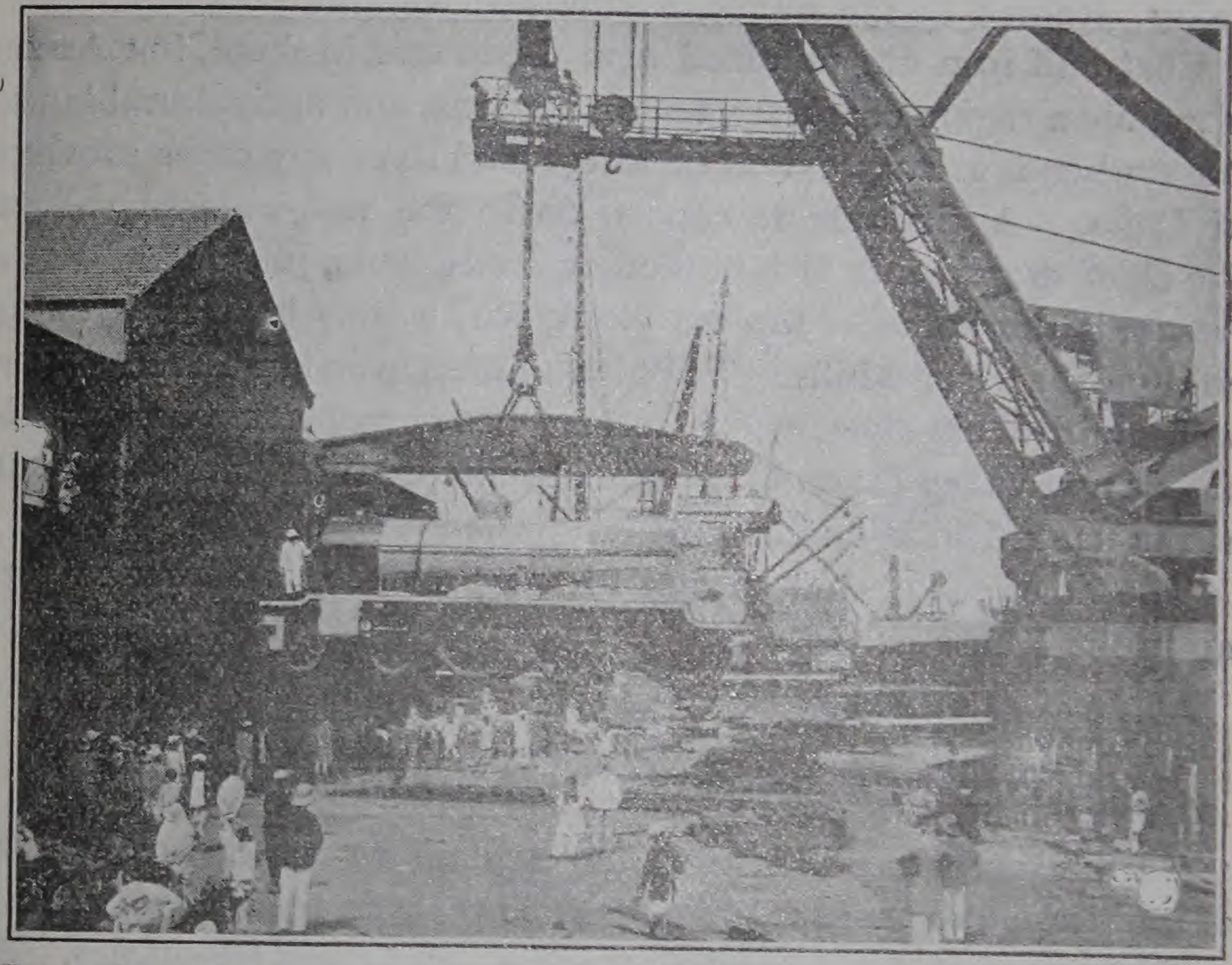


FIG. 184.—UNLOADING COMPLETE LOCOMOTIVES AT BOMBAY DOCKS.

Bengal railway runs from Calcutta to the foot of the forest-clad hills. From this point a mountain railway winds its way up the steep slopes, following a zigzag route to reduce the gradient. The train passes forests of teak entangled with masses of creepers, then tea plantations, and more forest with oaks, magnolia, sycamores and laurels. Finally it reaches Darjeeling, near the northern boundary of Bengal, and 7000 feet above sea-level. Beyond the town lies the deep valley of the Ranjit. Farther north there is ridge after ridge, and behind them the mighty Himalaya, where Kinchinjunga raises his snowy summit 5 miles above the sea.

THE HILL AND VALLEY PROVINCES

Looking farther east we see **Assam.** The eastern portion of this province is an upland region, consisting of the Patkai Hills, the Barail Range and the Lushai Hills. From the Barail Range a long spur runs westwards as the Khasi and Jaintia and the Garo Hills. This spur is the watershed between the two main valleys—the Valley of Assam, drained by the Brahmaputra, and the southern valley, drained by the Barak, Surma and Kangsa.

Coal and iron are obtained near Ledo and Makum, but Assam is mainly a region of forests, tea plantations, and agricultural lands. Assam has a greater extent of forest land than any other province in India. Agriculture is carried on in the well-watered valleys, the chief crops being rice and other food-plants, jute and oil-seeds. Assam is the home of the tea plant, which may be seen growing wild on the eastern hills. Tea plantations cover large areas on the well-drained hill-sides, which receive heavy monsoon rains, and in the Surma valley around Sylhet. Assam produces more than half of the tea grown in India.

The chief town, and capital of the province, is Shillong, high up in the Khasi Hills.

THE PLATEAU STATES AND PROVINCES

On the southern side of the Ganges plain we see the broken edge of the plateau of Central India. The breaks in the plateau are due to the action of the Chambal, the Son, and their tributaries. At its western end the plateau has also been divided by the broad valley of the Narbada. North of the Narbada is the steep scarp of the Vindhya Range, and south of it there is the Satpura Range—between the Narbada and the Tapti.

The Tropic of Cancer runs through the middle of the plateau, but no change of climate is observed on crossing the line: changes in climate are gradual. The plateau itself is the real boundary between north and south. In bygone times the dense forests which clothed the plateau were difficult to traverse; they formed the bulwark of southern people against the invasion from the north.

FIG. 184 (a). [*By permission of Imperial Airways.*

It is not surprising, therefore, that the people of peninsular India are different in type from those of the north, as we have already noticed. They do not differ in race and language only, but also in temperament. Inhabitants of a plain are usually more inclined to peace than those who live in hilly regions. It will be remembered that it was the inhabitants of the hilly region in the north of the Deccan who did much to break up the Moghul empire.

We shall consider the plateau of Central India as one region. But first we must notice that it contains two political divisions. These are the **Central India Agency** and the **Central Provinces and Berar.**

The Central India Agency consists of a number of states, the chief of which are Gwalior, Indore and Bhopal. It lies mainly on the north and north-west parts of the plateau. It includes the slopes facing the Ganges plain, but the western part extends southward over the Malwa plateau and the Vindhya Hills to the Satpuras. The Agency therefore includes part of the valleys of the Son, the Sind and the Narbada.

The Central Provinces and Berar are on the southern side of the plateau. This area is dissected by the Narbada, the Mahanadi and the Godavari.

This region of Central India may therefore be described as consisting of broad uplands and wide valleys. The uplands bear some forests of broad-leaved trees, but much forest has been destroyed by hill tribes, who burn the timber to grow food crops in the ashes. The valleys are fertile, and they are devoted to growing rice, under irrigation, millets, pulses and oil-seeds. Wheat is also grown on a small scale. Cotton is grown over large areas, especially in Berar.

In small states, population concentrates around the headquarters of the chief. Hence the most important towns in the Agency are Indore, Bhopal and Gwalior. Indore is an important commercial centre, exporting grain, tobacco and opium ; it is headquarters of the Malwa Opium Agency.

Some of the towns in the Provinces owe their importance to modern developments in connection with industries and transport. Warora is a cotton manufacturing town on the Wardha valley coalfield. Raipur is near rich deposits of iron ore. Nagpur, a large town on the Bombay-Calcutta railway, was the capital of one of the

Mahratta chieftains. It is now headquarters of the British administration. It possesses large cotton mills, supplied with raw material from the surrounding area. Jubbulpore has gained importance with the development of railways. There are G.I.P. railway workshops in the city, as well as cotton, oil, and flour mills and marble works.

On the next undulation of the Deccan we find the state of **Hyderabad** (the Nizam's Dominions). It stretches from the Godavari to the Kistna, and is bounded east and west by the Presidencies of Madras and Bombay. A former ruler of this state was *nizam* or viceroy of the Delhi emperors. He threw off his allegiance when Moghul power began to decline.

A noteworthy feature of the landscape is the scarcity of trees. The natural vegetation is mainly grass or scrub, for Hyderabad is a rain-shadow area. Small tracts of forest are found in the valleys beside the Godavari and the Kistna.

Hyderabad, the capital, is the largest city, and indeed the largest inland city in India; its population is 5 lakhs. Its mosques and palaces reflect the wealth of these famous dominions. Some of that wealth came from diamond workings in the south-east of the state. The stones were cut and polished at Golconda, which is just west of Hyderabad. The city is a great collecting and distributing centre; some of its people are engaged in cotton manufacture. Secunderabad, on its northern outskirts, is a military centre.

The state of **Mysore** is the southern and highest part of the Deccan. The Eastern and Western Ghats meet in the Nilgiri Hills on the south border, thus giving Mysore a rim of mountains on all sides except the north. On the western part of the rim is perched the tiny province of **Coorg**.

Mysore is therefore basin-shaped, but its surface is very irregular. The Cauvery rises in Coorg and flows across the southern part of Mysore. It breaks through the Eastern Ghats, forming waterfalls which have led to the establishment of a great power-station at Sivasamudram. The Tungabhadra and other rivers flow northwards to the Kistna.

Mysore has great stores of sandalwood, rosewood, ebony and cedar in the mountain forests. The people are noted for their carving in sandalwood, and for the silks they manufacture in their

homes. Many of the people of both Mysore and Coorg are engaged on coffee plantations. But much larger numbers find work on the Kolar goldfield, which is supplied with electricity from the Falls of the Cauvery.

The chief manufactures, textiles, earthenware, soap-making and others, are carried on in the cities, Mysore and Bangalore. Mysore is the capital, but Bangalore, an important railway centre, is a much larger city.

THE PRESIDENCY OF MADRAS

The northern boundary of Madras runs through Chilka Lake, near the Mahanadi delta. From this line the presidency extends along the east coast plain to Cape Comorin. It stretches westwards over the Eastern Ghats along the frontier of Hyderabad until it meets Bombay; and also through Palghat Gap and along the Malabar coast to meet Bombay again.

The eastern part of Madras is therefore a low coastal plain, backed by broken uplands. The Godavari, Kistna, Penner, Cauvery and other rivers break through the uplands, cross the plain, and reach the sea through deltas.

The western part of Madras is a coastal plain, backed by the mountain wall of the Western Ghats. Rivers on this side are short and swift.

Madras is an agricultural and plantation region. The deltas in the east are used for growing rice. This crop is also raised higher up the valleys, with the aid of irrigation from tanks. More rice is grown on the wetter western plain. Ground-nuts are grown on a large scale, and in the drier areas there are patches of millet, maize, pulses and oil-seeds. Plantation products include cotton, tobacco and coconuts. The coconut flourishes on the Malabar coast plain.

But the people are not wholly devoted to land work. Masulipatam was famous for its manufacture of cotton many centuries ago. In spite of the wonderful development of the industry in Bombay, the manufacture of cotton goods is still carried on in the Presidency of Madras, mainly in the south, at Madura and other places. But Guntur near the Kistna, and Bellary, in the wedge-shaped projection of Madras between Hyderabad and Mysore, are also engaged in the same trade.

FIG. 185.—A STREET SCENE IN JAIPUR.

Madras is almost as famous as the U.P. for its metal-work and woodcarving. It also possesses some fine examples of architecture in the temples at Madura, Trichinopoly and Tanjore.

The plain of the Carnatic, which lies in the south of the Presidency, has a hot climate. Unlike the north of India, it has no cool season. People employed in Madras are therefore glad to escape at times to a hill-station. In this respect they are fortunate. They can go by train through Salem to the foot of the Nilgiris. At Coimbatore the train begins to ascend the hills. It passes plantations of tea shrubs and cinchona trees, forests where the Indian elk and tiger may be found, and where semi-savage Todas have their home. At last it reaches rolling grass-covered hills, 7000 feet above the sea. Here is Ootacamund, one of the finest health resorts in the country. It is situated close to Dodabetta, the summit of which rises to 8760 feet.

Travancore lies wedged between the Cardamom hills and the sea. It is a small state, but it produces pepper, ginger and cardamoms, which are not grown in many parts of India. It is a region of beautiful scenery. Rivers descend from forested hills and meander across the rich plain beneath waving coconut palms and plantations of rubber trees. The forests produce teak, rosewood and other excellent timbers. Many people are engaged in wood and ivory carving, and in making coir-matting and cordage.

THE PRESIDENCY OF BOMBAY

Bombay lies stretched along the shorelands of the Arabian Sea. Its northern boundary is the province of Sind; its southern boundary touches the state of Mysore.

The Presidency therefore includes three regions: (1) the large plain with deficient rainfall which lies north of the Narbada, (2) the slopes of the Western Ghats and the narrow coastal plain (the Konkan) between them and the sea, which are drenched with rain during the hot season, (3) a portion of the rain-shadow region of the Deccan, behind the Western Ghats. Hence there is forest, grassland, scrub and desert to be found within the boundaries of Bombay.

The conditions of living therefore vary greatly. Agriculture is carried on without difficulty in the well-watered coastal plain

and in the valleys of the mountain flanks. In the rain-shadow region people run the risk of failure of their crops, but conditions in the Deccan have been much improved by irrigation works at Khatgar and Bhandardara.

All the usual food crops—rice, millets, pulses—are grown, and a large area is devoted to cotton plantations. But Bombay is a province with great interests in manufactures and commerce. Consequently many of the people live in towns. Factory industries have been developed in the city of Bombay on a great scale, especially for the manufacture of cotton. Hydro-electric power from the Western Ghats is being utilised to drive the machinery.

Some of the smaller towns are sharing in the industrial development. Amongst them are Sholapur, in the valley of the Bhima, and on the Bombay-Madras railway route, and Hubli, in the south-east corner of the Presidency. The former is a cotton manufacturing town and the latter has railway works.

Bombay, the second city of India, and one of the chief sea entrances, is situated on Bombay island. The southern end of the island is prolonged into two peninsulas, Colaba Point and Malabar Point. On the latter there is the residence of the Governor. Between the two points lies Back Bay. It has been proposed to reclaim this bay for the purpose of extending the city. A part of this scheme has already been carried out; should it be completed, Bombay will gain over 1000 acres of new land.

On rounding Colaba Point, vessels enter the large harbour which lies between Bombay island and the mainland. The docks are along the shores of the island, and they are connected with the mainland by the G.I.P. railway. Several miles out in the harbour there is Elephanta Island, famous for the temples carved out of its rocks.

Two railways connect Bombay with the mainland. The G.I.P. links the port with Delhi, Calcutta, Madras and other cities. The other railway, the Bombay, Baroda and Central India Railway, runs northward through Surat, Broach, and Baroda. The broad gauge line then continues via Rutlam to Delhi. A narrow gauge line goes from Ahmadabad. It passes between Mount Abu and the Aravalli Range, and goes through the head of the Luni valley to Ajmer and Delhi.

This is a very interesting route. In the dim past Aryan tribes wandered down the Luni valley to the Gulf of Cambay. During the days of the Moghul empire, merchants from the Ganges region used the route, and Broach was a great trade centre. In the eighteenth century Broach declined. Its trade was stolen by Surat, which is nearer the open sea. In the nineteenth century Surat also declined, largely because of the silting up of the estuary of the Tapti. Surat was superseded by the port of Bombay. Ahmadabad, a railway centre and cotton-spinning town, possesses some fine old buildings.

Sind, which was separated from Bombay by the Government of India Act of 1935, consists of the lower slopes of the Kirthar Range and the lower valley and delta of the Indus river. The region is one of the hottest and driest parts of India. A certain amount of cotton has been grown here and it is hoped the Sukkur Irrigation Scheme will make the land more fertile.

Karachi, near the Indus delta, is a very important port and gains additional importance from the fact that it is on the Imperial Airways route from England to Australia (see p. 349).

A number of small states, Cutch, Jodhpur, Kathiawar, Tonk and others, lie among the British districts, and in Rajputana. Most of them are famous for art and metal work, silks, carpets, lacquer and ivory ware. One of the most progressive states is Baroda, which gives great attention to education. The chief occupation is agriculture, but silks and cottons of quality are manufactured.

EXERCISES

1. Name provinces and states which produce timber, rice, tea, coconuts, rubber, spices on a large scale, and the ports through which any of these commodities are exported.

2. In which provinces and states are the cotton, steel and jute industries of special importance? Give reasons, and name the chief industrial centres.

3. Point out the difference between Kashmir and Bengal as regards surface relief, climate, occupations of the people, products and means of transport. Draw sketch maps of the two regions.

4. Differentiate between the northern plain and peninsular India as regards type of people, relief, climate, occupations and products. Draw sketch maps of the two regions and insert chief towns.

XXXVII. AGRICULTURE, PLANTATIONS, PASTORAL WORK, INDUSTRIES

Most of the food consumed by the people of India is produced within the country. In the north-west and the western part of the Deccan, wheat and barley or millet are the staple foods. These are supplemented by pulses and vegetables, and in Sind and Rajputana by dates. In the lower part of the Ganges basin, and on the shore-lands of the peninsula, rice is the principal food. This is supplemented by fish and fruit. Hill tribes live on millet and wild products of the forest. In some parts of India meat is consumed to a limited extent. It consists mainly of goat's flesh or poultry. People who live mainly upon cereals require some food in the form of oil. An oily butter (ghi), made from cream, is widely used. Other oils are obtained from plants. India is one of the chief producers of oil-seeds in the world.

There are 338 million people in India. They are fed on the produce of the fields. Agriculture is therefore the most important occupation. Three-quarters of the huge population is supported by work on the land. The people therefore live in villages rather than in towns. India is a country of villages. Notice the difference between agricultural India and industrial England. In England there are sixty-five towns with a population of over one lakh. India has only thirty-five towns of that size, though the population is nearly ten times as great.

Most English people find their work in towns. They depend upon other lands for supplies of food. Most Indian people find their work in tilling the soil. Apart from sugar they obtain little food from other lands.

The Indian village is practically self-supporting. The village potter, blacksmith and carpenter, the barber, cobbler, washerman and others perform their special kind of work. Most of the villagers cultivate their plots of land. Generally the work is shared by all the members of the family.

The peasant works his land carefully, but in most cases with primitive implements. He ploughs his field with a wooden grubber,

fixed by a long pole to the yoke of the bullocks. He cuts his crop with a small sickle. He threshes it by the treading of his bullocks. But the Department of Agriculture is gradually introducing modern methods. Tractors and other machines have appeared in some parts of the country. Modern methods will make the work of the ryot easier. They will make the land yield better crops and so improve the lot of the people generally. Areas which are not renewed by river floods need more treatment with manures or fertilisers.

The crops grown in different regions depend upon climatic conditions. The requirements of plants were described in Chapter XVI. But we may note again that rice is a " wet crop " and millet is a " dry crop." Wheat must have a warm dry season for ripening. Summer rains are very injurious to this cereal.

The **rice regions** of India include the lower part of the Ganges basin, Assam, the delta of the Indus, the west-coast plain and the deltas of the Deccan rivers. All these areas are able to provide the flood of water required by the growing plants.

The **millet region** consists of the hilly rain-shadow portion of the Deccan (including parts of Bombay, Madras and Central Provinces), Rajputana and Sind. In these areas rainfall is uncertain. But during the driest and hottest weather millet will live if the soil is watered. It is therefore a suitable crop for dry areas that are irrigated from tanks and wells. The millets most commonly grown are large millet (sorghum), small millet (ragi), and spiked millet (bajra).

The **wheat region** is a large area in the north-west. It extends across the Punjab, and down the Ganges plain as far as Patna, and from the Ganges on to the lower slopes of the Himalaya. Thus the wheat and rice regions overlap near Patna. It is supposed that wheat was introduced into India by invaders who settled in the north-west. Wheat is a cool season crop in the Punjab. It is followed in the hot season by millet and maize.

Many other crops—foodstuffs and raw materials—are grown in the regions mentioned. First we will notice the pulses. These are important, because they partly take the place of meat consumed by the people in cooler countries. They grow under varied conditions, provided their roots have sufficient water. Gram, lentils, or other varieties are grown in all parts of India—gram especially in the Punjab and United Provinces. Pulses are often found between

Fig. 186.—Ancient and Modern Methods of Agriculture in India.

rows of cotton, rice, and millet. They have a beneficial action upon the soil.

Oils are obtained from sesamum, rape and mustard, linseed, cotton-seed, and ground nuts. These are widely grown, and oil-seeds have an important place in the list of exports. **Linseed** is grown on a large scale in the black soil of the peninsula (Central Provinces), and also in Bihar, Orissa and the United Provinces. **Rape** is a cold season crop in Bengal and Assam ; it is also grown on a large scale in the Punjab. Sesamum is grown in Madras, the Central Provinces and Berar, and to a limited extent in Bombay. The **castor-oil** plant is grown on the borders of grain fields and in cottage gardens. The cultivation of this plant has declined through the import of kerosene for illumination purposes. **Ground nuts** are

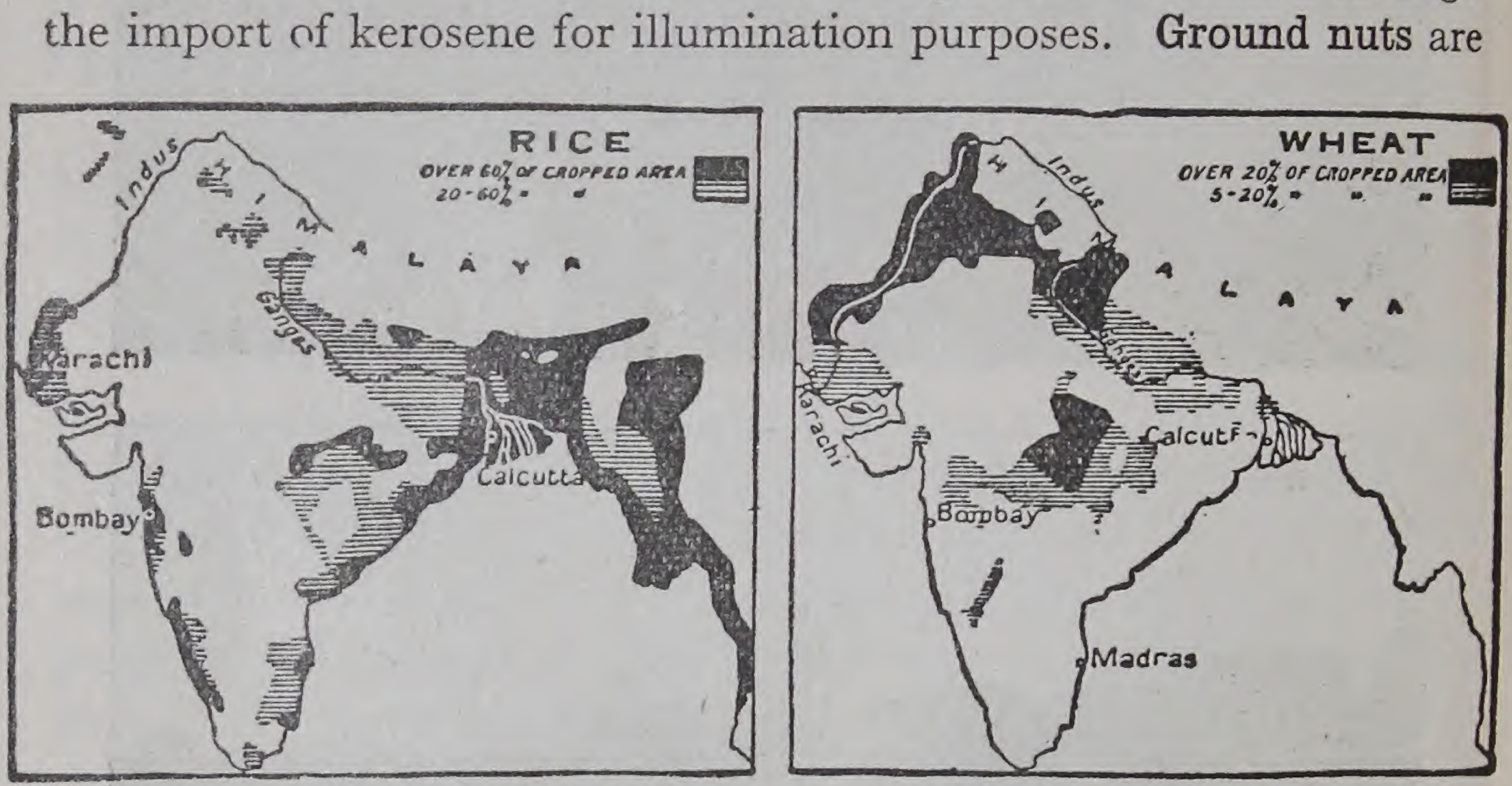


FIG. 187.—DISTRIBUTION OF RICE AND OF WHEAT IN INDIA.

grown chiefly in Madras, and it is on the shorelands of this province that most of the **coconut** palms are found.

Sugar-cane, indigo and tobacco flourish in a hot moist climate, but they can be grown under irrigation. **Sugar-cane** is grown chiefly in the Ganges basin—on a large scale in the United Provinces, and on a small scale in Bihar and in Orissa. Bihar has practically a monopoly of **indigo** manufacture. The use of chemical dyes has greatly checked the cultivation of indigo. **Tobacco** was introduced to India by the Portuguese 300 years ago. The plant grows well in many parts of the country. The chief producing regions are Madras, Travancore, Bengal, Bihar and Orissa, United Provinces,

the Punjab, and the area between the Malwa plateau and the Gulf of Cambay. Much of the tobacco grown in the Ganges region is exported to Burma for the manufacture of cigars. But the manufacture of cigarettes has grown rapidly in Bengal.

The **opium poppy** is grown under licence from the Government in the Ganges basin, for manufacture in the Ghazipur factory, and on a smaller scale in Rajputana and the Central India Agency. Opium from Central India is known as "Malwa opium."

Several plants are cultivated for the sake of their fibre. The most important are cotton and jute.

The largest **cotton-growing** area is the basaltic plateau in the north-west of the Deccan—Kathiawar Peninsula, Gujarat, northern Bombay, and Central India. The volcanic soil of this region is so suitable that it is known as **black cotton-soil.** Rainfall is deficient, but whatever rain does fall is retained by the soil in most remarkable fashion. Cotton is also grown under irrigation in the U.P., the Punjab, Sind, and the north of Madras Presidency. Another cotton-growing area has been developed in recent years. This lies on the east side of the Cardamom Hills, in the Presidency of Madras. The red soils of this region produce cotton of very good quality.

India is the world's chief producer of **jute** for manufacturing purposes. This crop is raised on a large scale in Bengal and Assam. Jute flourishes in alluvial soil, and it can be seen standing 8 or 10 feet above the rice fields beside the Ganges and the Brahmaputra.

The cultivation of tea, coffee and cinchona are mainly European enterprises. The **tea shrub** grows wild on the hills of Assam. This fact shows that it prefers a warm moist climate. But it is grown on a small scale in some of the drier parts of India. The chief tea-producing regions are the two valleys of Assam, and the slopes of the Himalaya around Darjeeling. Less important regions are the United Provinces, the Punjab and the Nilgiri Hills. More than half of the tea plantations of India are in Assam. They provide employment for many thousands of people.

The **coffee plant** is said to have been brought to India by a pilgrim from Mecca. It is less hardy than the tea shrub, and is grown only in the south of the peninsula. The chief plantations are on the east side of the Western Ghats (in Mysore), and in Travancore.

The **cinchona** tree was introduced from South America by the Government. It is grown on the Himalaya near Darjeeling, and on the Nilgiris. The bark is used for the manufacture of quinine, which is sold to the people at a low price.

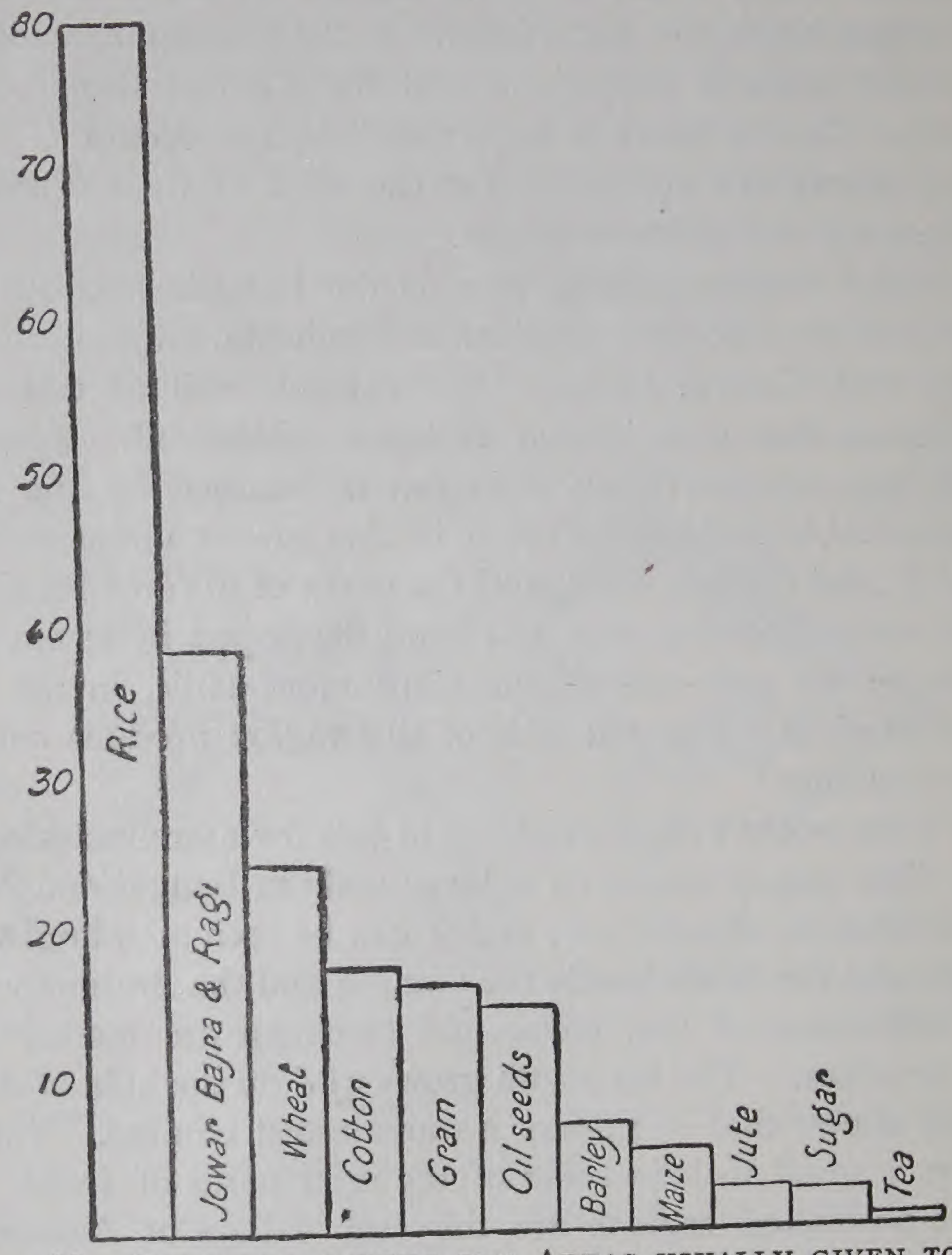


FIG. 188.—DIAGRAM SHOWING THE AREAS USUALLY GIVEN TO THE PRINCIPAL CROPS OF INDIA.

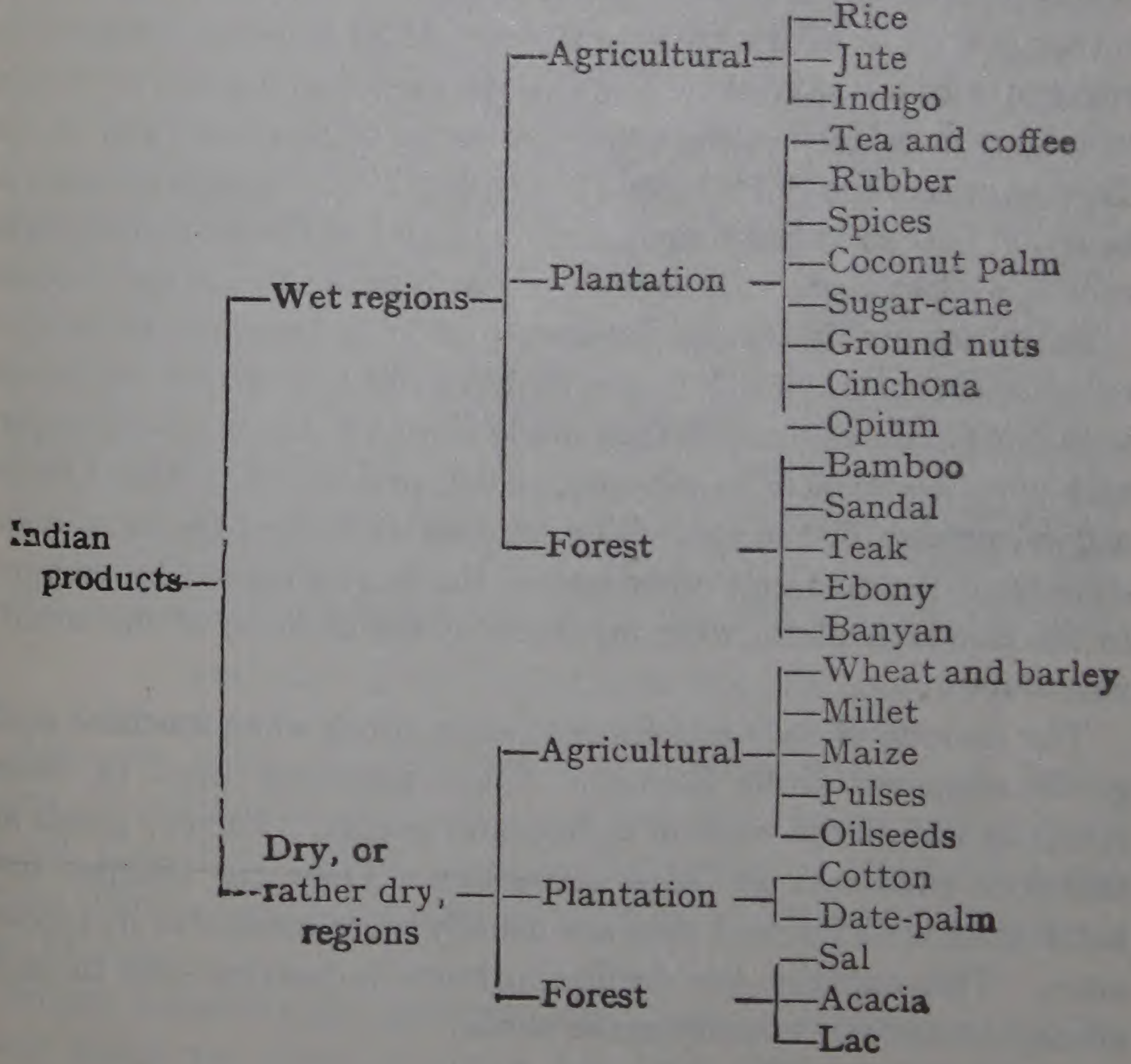
(Various grains and pulses occupy an area about equal to that under wheat.) Figures denote millions of acres.

Two very valuable palms are grown in India. One is the **coconut palm**, which likes a hot moist seaside climate. It is grown on a large scale on the coastal plains of Madras, and to a smaller extent on the Bombay shorelands. But the region most famous for coconuts is Ceylon. For the uses of the coconut refer to page 108.

The **date-palm** likes a hot dry climate, and it is the typical tree of oases in the desert. Its fruit forms a useful food in regions where grain can only be grown with difficulty.

Lac may almost be described as a special product of India. The only other countries that produce it are Siam and the Straits Settlements. Lac is a kind of resin deposited on the branches of certain trees by the lac insect. Twigs are collected and broken up. The resin is separated and thoroughly washed and is then known as seed-lac. This goes through the process of melting and then hardening, and the product is called **shellac**. The culture of lac is carried on in Chota Nagpur, the north of Orissa and the west of Bengal. Mirzapur is also a centre of the industry.

The products of the fields, plantations and forests of India may be roughly grouped as shown below. We must remember, as explained above, that some plants will grow under varied conditions.



In India, animal products are not so much used as plant products. **Pastoral work** therefore receives less attention than agriculture. In spite of this, there are more cattle in India than in any other country in the world. This may be explained by the use made of the animals. Indian people employ bullocks and buffaloes for pulling wagons and for work on the land. In other countries this is generally done by horses or machines.

The most important cattle-rearing region is in the north-west. It is a belt of land extending from Kathiawar through Rajputana and the Punjab to Kashmir. The finest animals are bred in Gujarat. This belt is suited to cattle-rearing because of its low rainfall. All soils contain salts which preserve the health of cattle. Many parts of India receive so much rain that the salts are washed out of the soil. Other areas where cattle are reared are the Malwa plateau and northern Madras. Buffaloes take the place of bullocks in the wet plains of Bengal.

Few countries are so well provided with goats, but India takes a rather low place with regard to sheep. Most peasants keep one or two goats for the sake of their milk. But sheep and goats are reared in largest numbers amongst the mountains of Kashmir, and on the dry pastures of the Punjab and the Deccan hills. Camels are used as beasts of burden in Rajputana and Sind, and on the north-west trade routes, whilst elephants are employed in Burma, Assam and Ceylon.

Industries and Industrial Centres. India is described as an agricultural country. But her people have always carried on certain industries. Centuries ago they made silk and cotton goods, carpets and shawls, and articles of ivory, metal, and wood. These found a good market in Europe. The muslins of Dacca, the hand-made silks from Benares and other towns, the ivories carved by villagers in the northern plain, were regarded as the choicest of the world's manufactures.

The making of such articles received a check when **machine-made goods** appeared from Europe. Some machines used in cotton factories will do the work of a thousand people. Factory goods are therefore produced in large quantities. They are cheaper than hand-made articles, and they are usually more attractive in appearance. This explains the decline in home industries—not in India alone, but in every country in the world.

Cottage industries have not died out in India. Muslins are made in many parts of the country, but especially in Bengal, Assam and the mountain states. The silks, once so highly valued in Europe, are made at Benares, Ahmadabad, Murshidabad, Trichinopoly and other old towns. The sheep and goats of Kashmir and the Punjab provide wool and hair, which is made by villagers into blankets, shawls and carpets. The blankets and shawls are used chiefly in India, but the carpets have a good market in Europe. Some of the Kashmir workers have migrated to the Punjab. They follow their occupation in such towns as Amritsar, Lahore and Multan.

FIG. 189.—A CATTLE FAIR IN THE PUNJAB.

Amongst other old handicrafts are ivory-carving at Delhi, Agra, Murshidabad, and other places; the making of perfume in the United Provinces; and the fashioning of beautiful metal vases, platters and other articles at Benares, Moradabad, Jaipur and Madras.

Indian industries are gradually changing. Factories are doing work which for many centuries has been done on hand-looms.

There are over 5000 factories and workshops in the country. The **cotton** grown on the Deccan is manufactured in Bombay and the district round the city. Here there are cotton mills to the number of nearly 200. Next in importance as cotton manufacturing states are Madras, the United Provinces, Bengal, and the Central Provinces. Important centres are Cawnpore, Delhi, Nagpur and Madras.

Cawnpore has become one of the busiest industrial towns in the north. It is situated near the sheep and cattle-rearing regions named above. These supply its mills with raw material for making **leather** and **woollen** fabrics. Large quantities of boots and saddlery are made, partly for use in the army, and partly for export. Similar work has been started in the cities of Bombay and Madras.

Not many years ago most of the **jute** grown in Bengal was exported to Britain and Germany. The times have changed. Now, nearly half of the jute goes to the seventy-five mills of Calcutta and Howrah to be made into gunny bags.

The **steel industry** has developed in Bengal, Bihar and Orissa, the Central Provinces and Mysore. The Bengal Iron and Steel Company has works at Barakar. These are supplied with iron ore from Singhbhum, and coal from Karharbari. Still larger works have been established near a rich ironfield at Tatanagar (Jamshedpur) by the Tata Iron and Steel Company. Limestone is found in Singhbhum, manganese is brought from Balahgat (Central Provinces), and coal is obtained from Jherria.

The Tatanagar works manufacture steel rails, wire, nails, and other articles, as well as machinery for use in mills, and chemicals. A special branch of work is the manufacture of tinplate. This is made into canisters used by the Burma and Anglo-Persian oil companies. Twenty years ago not a single oil-tin was made in Bengal. Now there are factories at Budge-Budge, near Calcutta, turning out a lakh of tins every day.

Amongst other industries are those connected with timber—lumbering, the sawing and pulping of timber, and the manufacture of paper, matches and resin. These are, of course, carried on near the forest regions, in Bengal, the U.P., and on the Malabar **coast.**

Tile-works, producing Mangalore tiles and drain-pipes, and soap factories on the Malabar coast, find employment for a considerable number of people.

FIG. 190.—SKETCH MAP SHOWING SOME OF THE TOWNS WHICH WILL BE SUPPLIED WITH POWER FROM THE MANDI SCHEME.

The Mandi hydro-electric power scheme makes use of the snow-fed waters of the Uhl, which joins the Beas near the town of Mandi. Water will be led through a tunnel $2\frac{1}{2}$ miles long, and dropped through a fall of 1800 feet to the first power station. This station will supply power to twenty towns in the basins of the Beas and the Ravi. Further developments will make it possible to supply cheap electric energy to many other towns, including a number in the basin of the Jumna. Industries will benefit; agriculture will improve because irrigation will be greatly extended; and the railway will probably be electrified.

The demand for power in factories has led to the development of **hydro-electric power** schemes. A dam is built across a river valley high up in the hills. Water is led from the lake thus formed, through pipes to a power-house at a lower level. Here it sets turbines or water wheels in motion. The turbines operate dynamos which

generate electricity. The electricity is conducted by cables to industrial centres.

A scheme of this kind was carried out in the Western Ghats by the Tata Iron and Steel Company. Electricity generated at Khopoli is used to drive the machinery in cotton mills in Bombay. A much bigger enterprise is that known as the Mandi Hydro-electric Scheme. Its purpose is to provide cheap power for a large number of towns in the Punjab. Details are given in Fig. 190.

EXERCISES

1. What conditions are required for the cultivation of rice, millet, wheat, cotton and tea? In which parts of India are these produced on a large scale? Mark each region on an outline map.

2. Name parts of India that grow oil-seeds and plants that yield useful fibres, saying what kind in each area. Say also for what purpose each commodity is produced.

3. What are the chief factory industries of India and where are they carried on? Mark each area on a sketch map of India, and give reasons why the industries are carried on in those areas.

4. Give details of schemes for supplying power for Indian industries, illustrating your answer with sketches.

XXXVIII. TRADE, TRANSPORT AND SEAPORTS

Ever since man appeared upon the earth he has loved to trade with his fellow men. Far away back in prehistoric times people lived upon natural products of the earth. But there were differences in occupation. One man would hunt animals in the forest, another would catch fish, a third would collect roots and berries, whilst another might give his time to making stone implements. The difference between their possessions would lead to trade.

The maker of implements would want food. He would give one of the tools he had fashioned for a piece of meat or a handful of berries. The hunter and the fisherman would not wish to live upon flesh alone, and the collector of forest products would be glad to vary his diet with meat or fish. Hence fish or meat would be given in exchange for a supply of vegetable food. Each man would profit by the labour of his fellows.

This explains why trade has been carried on throughout the ages. Different lands yield different products. People desire things their own land does not produce. They wish to sell things they cannot use themselves.

India is one of the oldest trading countries in the world. Thousands of years ago, when Europe was occupied mainly by savage tribes, Indian products were being sent eastwards to China, and westwards to Mesopotamia and Egypt. Caravans toiled up the Khyber Pass and over the plateau of Iran. They carried precious stones, articles made of ivory, wood and cotton. Sometimes they took with them dogs of a breed highly valued by western peoples.

Later on, Arabs engaged in the Indian trade, and the sea became the highway of trade. Vessels skirted the coast until they reached the head of the Persian Gulf, or they sailed up the Red Sea and delivered their cargoes in Egypt.

Trade between India and western lands became greater as time went on. The people of Europe settled down into nations. They wanted the cottons, silks, ivories and spices of India. Venice became the great distributor of these goods in Europe.

When the Red Sea route was obstructed by Turkish conquests, Europeans would not be deprived of Indian merchandise. They found another route round the Cape of Good Hope. Then the Portuguese, French and British established trading stations in the country, and laid the foundations of India's modern trade. In 1869 the Suez Canal was constructed, and traffic swung back again to the Red Sea route.

Since the appearance of the British the trade of India has greatly increased. It is now twenty times as great as it was 100 years ago. This great increase is due to several factors—the most important ones, apart from national qualities, being the building of good roads and railways and the construction of irrigation works.

Irrigation has affected trade in more ways than one. It has enabled the people to grow more food and raw materials than they require for their own use. Thus there is a surplus for export, and profit for the people. It has therefore improved the standard of living of the people, and enabled them to buy things they would otherwise have done without.

Railways and roads foster trade by making it possible to transport

goods to the coast for export. It is useless to raise large crops in the middle of a country if they cannot be disposed of.

EXPORTS AND IMPORTS

The character of Indian exports has undergone several changes. In early times India exported articles mentioned earlier in this chapter. When European industries developed, India became an exporter of primary products. During recent years Indian industries have been established, and the exports now include some manufactured articles.

The chief buyers of Indian merchandise are Great Britain, other countries in the British Empire, Japan, the United States of America and Germany. Next to these come China, and certain European countries, chiefly Italy, Belgium, Spain and Austria.

Great Britain is the greatest buyer of Indian produce, and the greatest seller of goods to India. This is easy to understand. Britain is, of course, specially interested in the prosperity of India. Apart from that, there is the difference between the countries. India is mainly a land of primary producers; Britain is mainly a land of industrial workers. Each has a surplus of things the other requires. This applies in a less degree in the case of Germany, Japan, and other countries that trade with India.

The flow of trade between such countries as India on the one hand and industrial lands like Britain and Germany on the other may be illustrated thus:

Agricultural people — Foodstuffs and raw materials → Industrial people

Industrial people — Manufactured articles → Agricultural people

Remembering this, it is not difficult to give the direction of India's foreign trade. About half the jute grown in Bengal is exported. Large quantities go to Dundee in Scotland, and to Germany, to be used in making canvas, carpets, linoleum and other goods. Smaller quantities go to the United States and France. The jute gunny-bags made at Calcutta, Howrah and Serampore are sent to Britain, United States, South America, the Straits Settlements, and parts of the British Empire—especially Australia. They are used for packing cotton, sugar, coffee, rice and other merchandise.

Raw cotton is exported from Bombay and Madras to Britain,

Japan, China, France and some other European countries. Bombay has for some years been supplying cotton yarns to China. This trade is decreasing because of the starting of cotton mills round Shanghai. Both Bombay, the "Manchester of the East," and Madras, send large quantities of cotton piece-goods to Mesopotamia and Persia.

Wheat from the Punjab and U.P., and rice from Burma and Bengal, go mainly to Europe. Britain is the greatest buyer of wheat. Germany has recently taken the greater part of the rice.

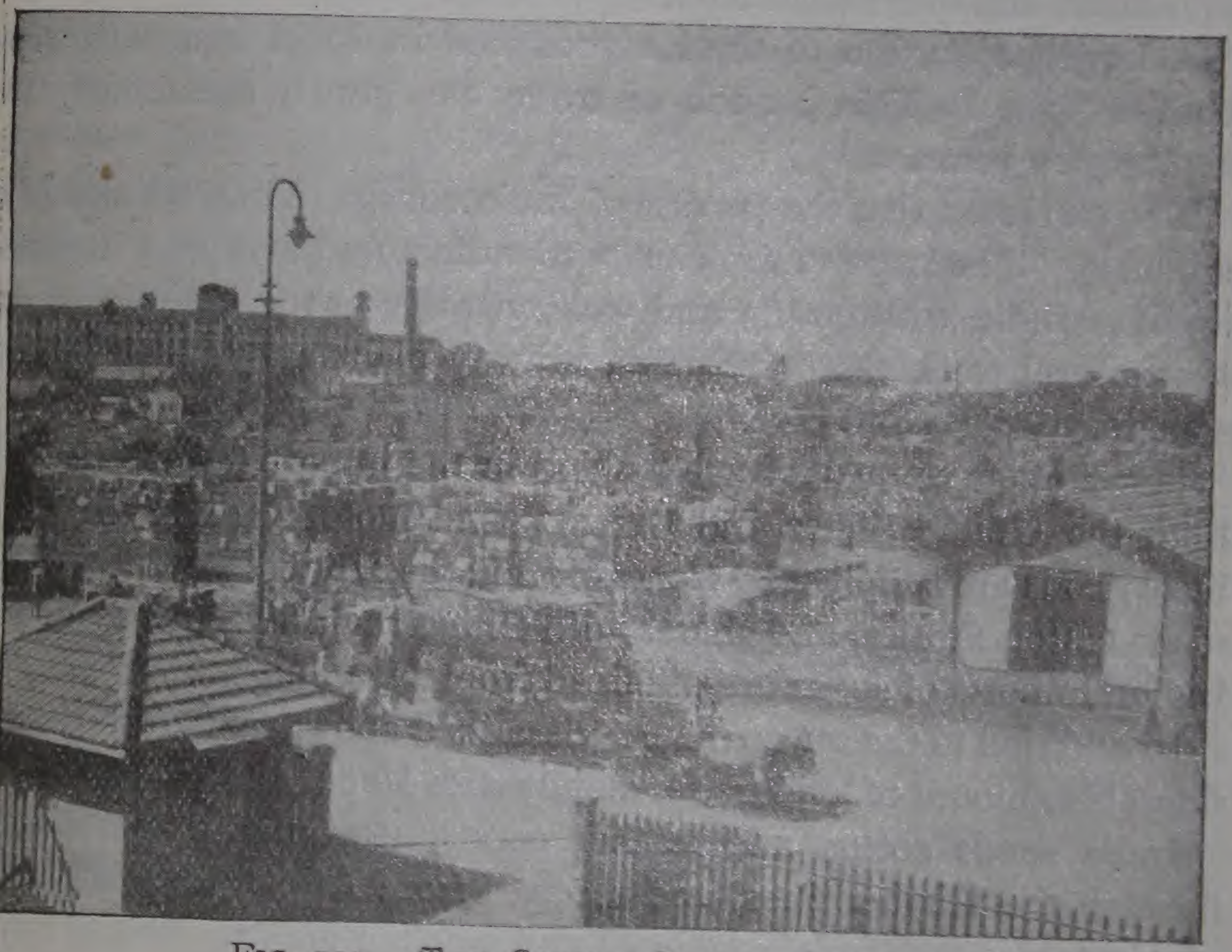


FIG. 191.—THE COTTON DEPOT, BOMBAY.

n previous chapters we noted that large numbers of Indian people re employed in the Malay Peninsula and East Africa. This has d to the export of rice to these lands.

English-speaking people are large consumers of **tea.** Formerly ey obtained supplies from China. But for many years they have en using tea sent from Calcutta, Calicut and Colombo. Britain ys over 80 per cent. of the tea sent out of India, but some is ported to the United States, Canada and European countries.

Oil-seeds are in great demand in Europe. The oil they yield is ed for making paint, linoleum, oil-cake for cattle and other

things. India supplies oil-seeds to Britain, France, Germany, Holland, Belgium, Spain and Italy. In past years the Americans have bought much linseed oil in India. At present they are obtaining supplies from Argentina, which is the only other country producing oil-seeds on a very large scale.

Raw hides and skins go mainly to Germany and the United States, but Austria and Italy have a small share in the trade. Hides ready dressed and tanned are exported to Britain to be used in the boot trade and other industries.

A large proportion of the **lac** produced in India is sold to the United States. This branch of trade has grown enormously in the last few years.

Thus it is seen that the exports of India consist mainly of primary products. The **imports** are chiefly manufactured articles. Britain supplies India with cotton and woollen piece-goods, articles made of iron and steel, motor vehicles, railway plant and rolling stock, machinery, glass and coal.

Many other countries have a share in the import trade of India. Both the United States and Canada send motor cars and trucks. Steel goods are supplied by Germany and the United States. Japan sends cotton fabrics, and shares with China the trade in silk goods. Indian imports of sugar are obtained from Java and Mauritius.

In addition to the sea commerce described above, India has a considerable amount of land trade, mainly with Nepal and Afghanistan.

India sends cotton and leather goods, tea, sugar, and indigo through the Khyber Pass, and receives from Afghanistan supplies of vegetables and fruit, raw wool and woollen goods. Nepal buys cotton piece-goods, and cotton yarn for use in home industries, and sends to India supplies of rice and other grains, ghi, hides, cattle and jute. Persia exchanges carpets and dates for tea and sugar.

Burma sends rice to India—chiefly to Madras—and also kerosene oil and petrol, and imports cotton goods and gunny bags from India.

SEAPORTS

A port is a gateway of commerce. It is the place where merchandise comes into or goes out of a country. A port must have a harbour, protected from the open sea, and provided with docks where ships can be loaded and unloaded.

The best place for a port is the mouth of a wide river, such as the Hooghly. Docks can be constructed on each side, and the river provides a means of transport to and from the port. In addition, the flowing tide assists shipping, and it fills the docks at high water. But rivers carry down sediment. If this is not removed the river channel may become silted up. This happened in the Tapti, and Surat became an unsuitable port for large vessels.

Other good sites for ports are bays or indentations in the coast, such as that on which Karachi is situated, or an arm of the sea protected by islands, as in the case of Bombay. Sometimes ports are made, or improved, by building moles or breakwaters. Madras has two moles about 500 feet apart. They extend seawards for nearly 4000 feet. The harbour has to be dredged, because the monsoon currents carry into it large quantities of sand.

A good harbour is not enough to make a prosperous port. There must be a well-peopled region behind the port, with a population producing things for export, and requiring articles from other lands. There must also be good means of communication between the port and its "hinderland" (=the region behind). Railways, roads, rivers and canals provide means of transport to and from the port; they are channels for distribution of imports, and for the collection of exports.

Judged by the value of their trade, the ports of India may be arranged in three groups. In the first group we have Calcutta and Bombay, which are of outstanding importance. Three-quarters of the foreign trade of India passes through these two ports. They are "outlets" for important producing areas, and they are the chief sea entrances to India. Calcutta exports the produce of the tea plantations, jute fields, opium and tobacco plantations of Bengal and the adjacent provinces, and

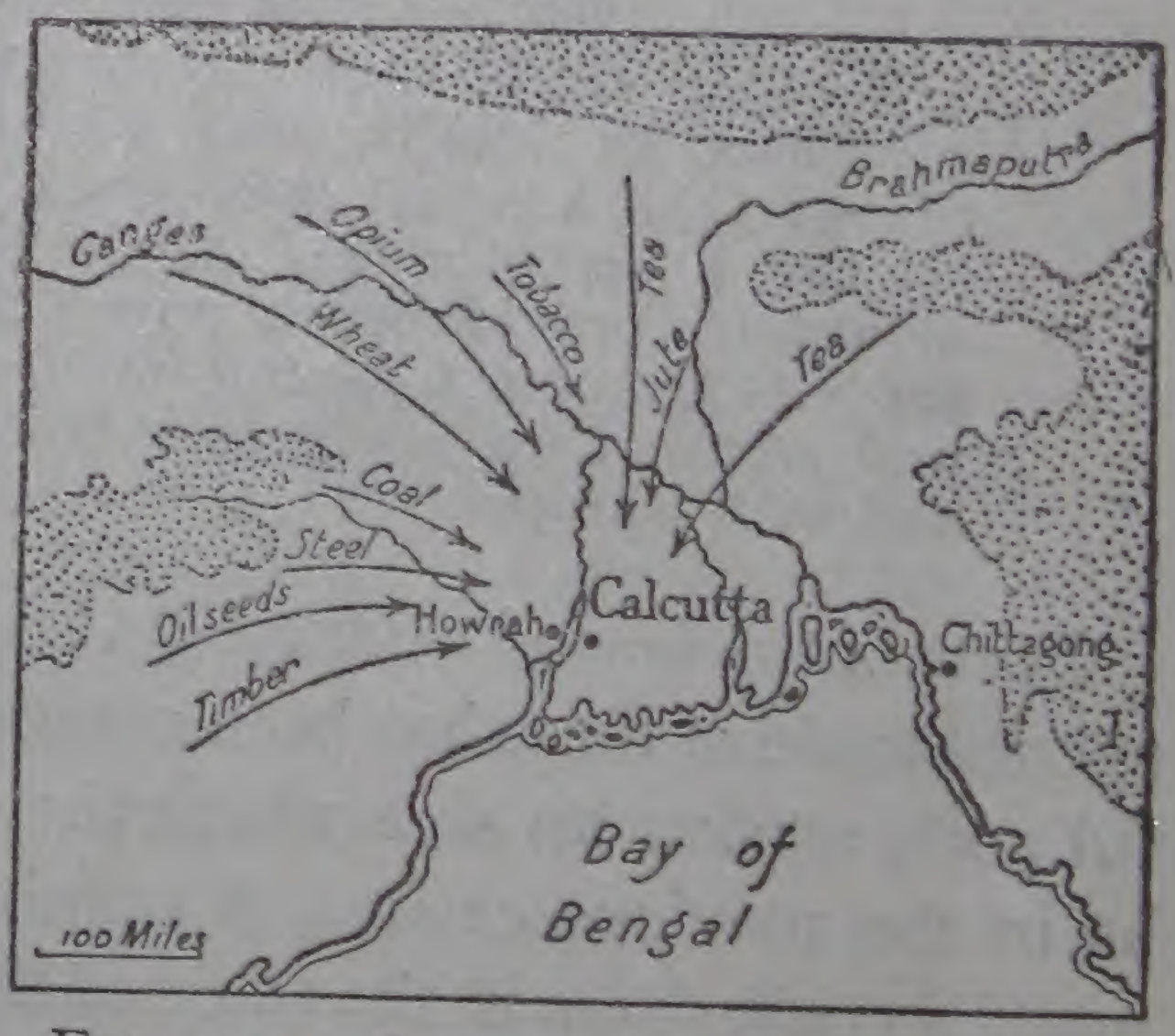


FIG. 192.—SKETCH MAP SHOWING THE SITUATION OF CALCUTTA, AND THE COMMODITIES SENT TO THIS PORT FROM THE SURROUNDING REGION.
(Dotted areas represent high land.)

also the articles manufactured in its jute, leather, tinplate and other works.

Bombay is the chief port of the great cotton-growing region. It has also much trade in cotton goods and other articles made in the city and in the surrounding area. Bombay is also a great passenger port. It is the first port vessels approach when they leave the Red Sea. Travellers can reach Delhi and Calcutta in the shortest time by landing at Bombay. Thus Bombay is the port for Delhi, and strange though it may seem, Bombay is actually the passenger port for Calcutta and Madras.

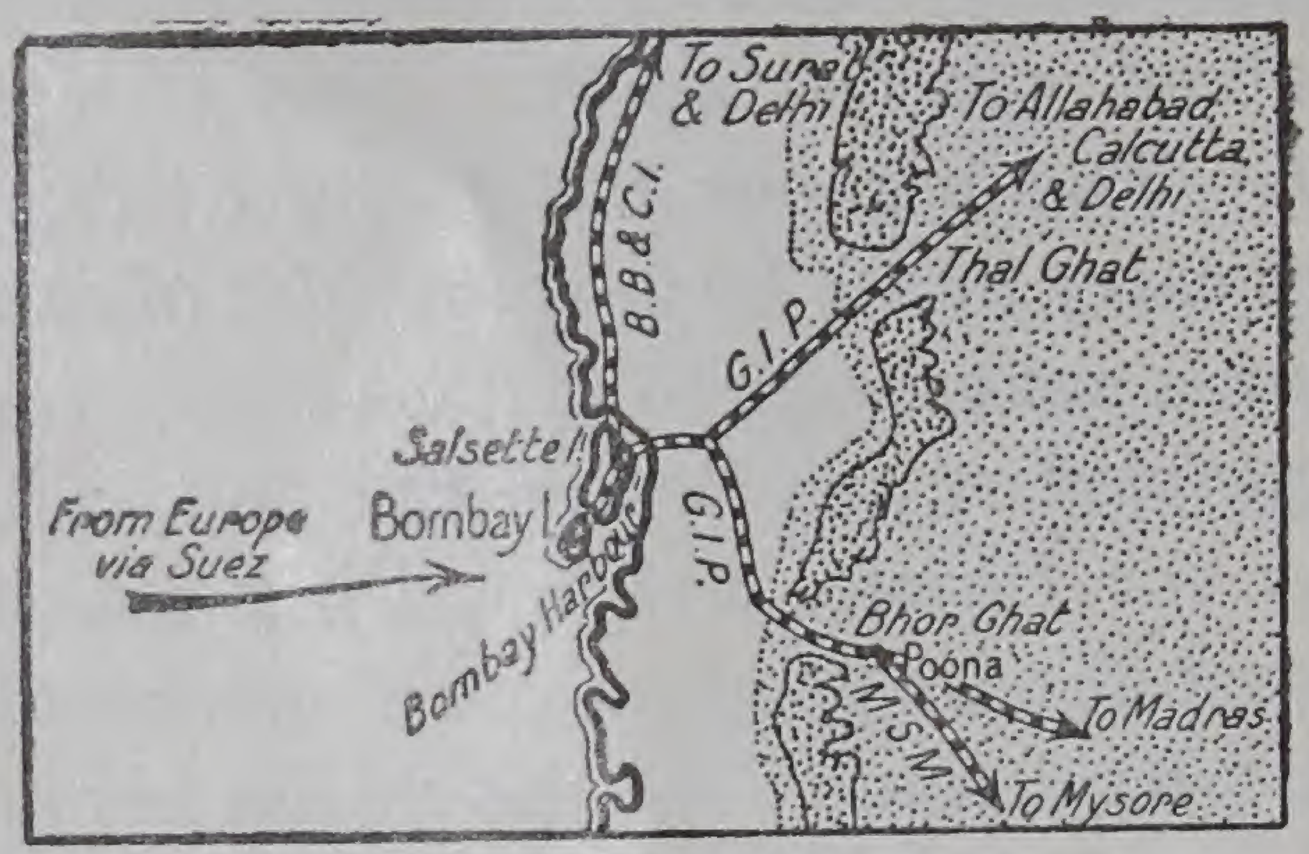


FIG. 193.—SKETCH MAP SHOWING THE SITUATION OF BOMBAY.
(Dotted area represents the plateau.)

Bombay has become a great city because (1) it has a very good harbour; (2) it is the nearest good port to the Red Sea route; (3) it has very good transport systems to the interior; (4) the plain produces ample supplies of food; (5) the mountains provide water power and timber; (6) the plateau supplies raw cotton for the Bombay factories; (7) Bombay is well situated for trade with lands across the Indian Ocean and with Europe.

Ports of the second rank are **Rangoon**, **Karachi** and **Madras**. The special trade of these has been mentioned above. Each is a successful port, serving an area where the population is not quite so large as in the previous cases. A number of small ports on the Coromandel coast share in the trade of the Presidency of Madras.

The third group includes ports with harbours suitable for small ships. They have a large coastal trade. On the west coast we find Surat, Mangalore, Calicut, Cochin, in addition to the Portuguese port Goa and the French port Mahé. Calicut, the most important of this group, exports coconut products and coffee. On the shores of the Bay of Bengal we find Moulmein, the Burma

timber port, and Chittagong, the natural outlet of Eastern Bengal and Assam. Then there is Cocanada in Madras, and the French ports Pondicherry and Karikal. Farther south we notice Tuticorin on the Gulf of Mannar, which has a special trade with Ceylon. This port is also a pearl-fishery centre.

Vizagapatam may be described as a port of the future. It will probably become the chief outlet for Central India, with which it is connected by railway. Vizagapatam has one advantage over the great port on the Hooghly. The approach to Calcutta is rather dangerous, and vessels usually require a pilot for two days. At Vizagapatam a pilot will be needed for one hour only. But the region behind the port is not so densely peopled as that behind Calcutta. Thus while Vizagapatam may steal some of the trade of Central India from Calcutta, it is not likely to become so great a seaport.

Cochin, on the Malabar coast, will be one of the most important ports of India in the near future. It has only recently been opened.

TRANSPORT

Before the establishment of British rule India was not well provided with means of communication. Few of the roads were fit for wheeled traffic throughout the year. Roads which had been constructed for military purposes were neglected after the fall of the Moghul empire. Trade was carried on by pack bullocks, or by boats moving slowly along rivers and canals.

At the present day trunk roads connect all the principal towns. One of the most famous roads is the Grand Trunk Road. This was constructed, about 100 years ago, along the great natural route of northern India. It stretches from Calcutta to Delhi, and by way of Ambala towards the north-west, thus passing through the most thickly peopled region. Another road worthy of special mention is the Darjeeling Cart Road, constructed with great skill. It is not steep though it rises 7000 feet in a distance of 51 miles.

The first railway in India was opened in the year 1854. Now the total length of track is over 43,000 miles. Railways are valuable for many reasons. They provide swift means of communication. They link towns and villages, and establish connections between distant parts of the country. They transport very large quantities of merchandise to and from the ports. They provide a means of

conveying food to regions that may be threatened with famine. They make it possible to settle colonies in newly irrigated areas. Their swift service renders them of special value in transporting troops to defend the frontier. They are the means by which the Post Office distributes letters and parcels in all parts of the country.

In level regions like the northern plain there are few difficulties in the way of railway construction. This region is traversed by a great number of lines. Breaks occur where the rivers are wide, but there is a fine bridge over the Ganges at Sara.

In the peninsula the direction of the railways is determined to a very large extent by the configuration of the land. Gaps between hills, passes over the Western Ghats, and river valleys have been utilised by railway engineers. In the Western Ghats the railway builders displayed great skill. The lines are carried up the mountains by careful gradients. The construction of these involved making loops, and blind ends where trains are reversed.

Let us follow on the map the route of some of the principal railways. Starting at Howrah, we travel by the **East Indian** railway, past the branch to the E.I. mines at Giridhi, through Patna and Benares to Allahabad. This is an important junction, being the point where the G.I.P. line from Bombay and Jubbulpore meets the E.I. Continuing our journey, we pass Cawnpore and reach Ghaziabad. Here we change to the **North Western** railway, run through Lahore and across the Punjab to Peshawar. There is another way to the N.W. system from the middle Ganges. It is the E.I. line that links Moghal Sarai, near Benares, with Lucknow, Bareilly and Saharanpur.

As its name indicates, the North Western railway serves the whole of north-west India. It connects the Punjab towns with the wheat port, Karachi. On the way down the Indus plain it throws off a branch to the "Western Gate" of India in Baluchistan. This branch crosses the Indus by a very fine bridge which connects Rohri and Sukkur. Then it goes through Shikarpur and Jacobabad into the wide gap between the Sulaimans and the Brahui range, and up the Bolan Pass to Quetta. Here the line branches. One portion goes in the direction of Kandahar, but stops at the Afghan frontier station, Chaman. The other winds away over the plateau to Duzdap, just beyond the Persian frontier.

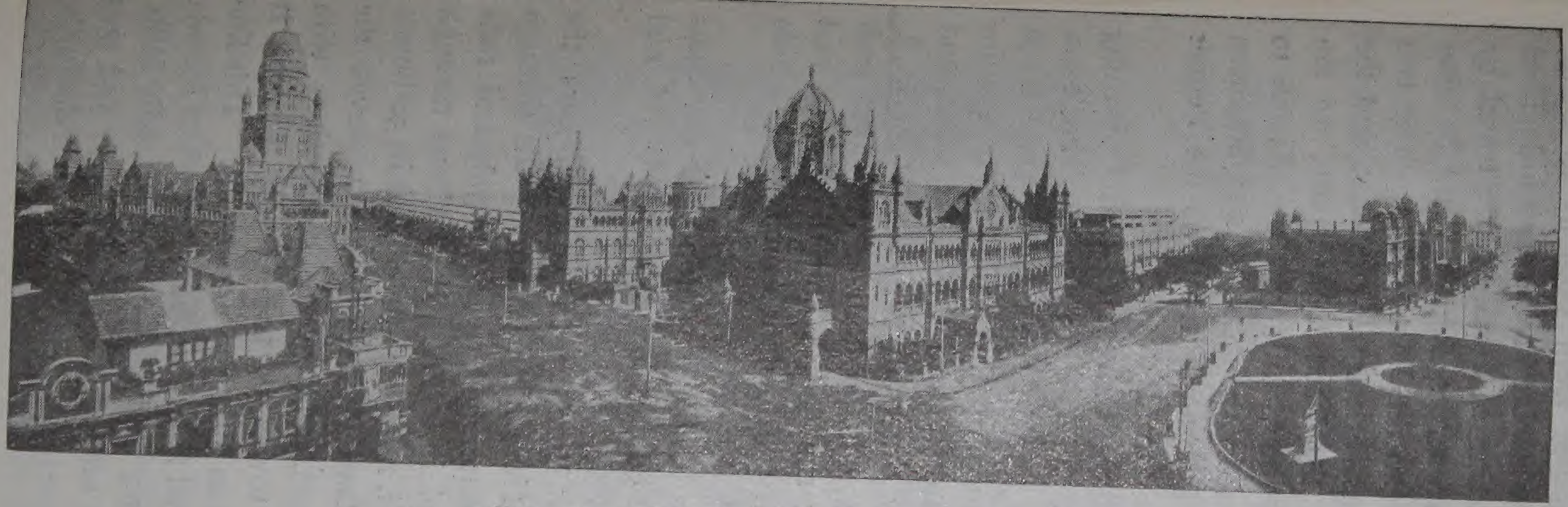
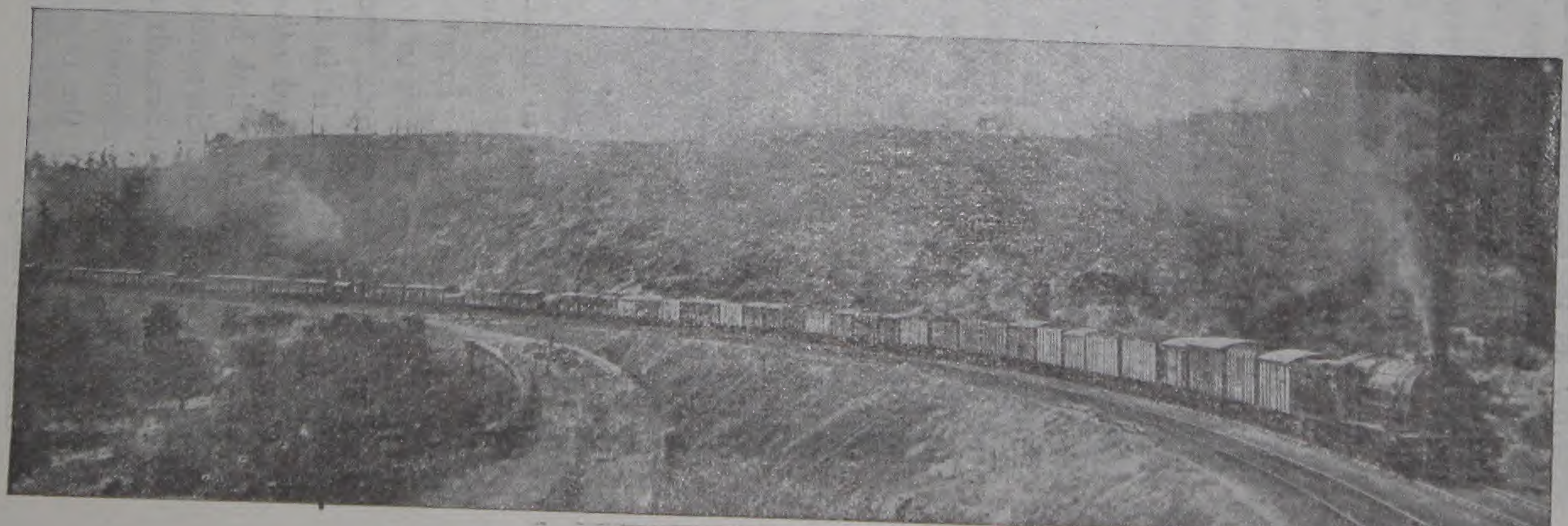


FIG. 194.—VICTORIA TERMINUS, BOMBAY.



Now let us examine the mail routes from Bombay to Delhi, Calcutta and Madras. Notice how surface relief has influenced the direction of the railways. Starting at Bombay, we travel by the **Great Indian Peninsula** railway across Bombay and Salsette islands to the mainland. Near Kalyan the line divides. The two branches ascend the Western Ghats, one by Bhor Ghat and the other by Thal Ghat. Following the Bhor Ghat route, we are carried down the valley of the Bhima, and over the Kistna to Raichur. Here the train runs on to the **Madras and Southern Mahratta** railway. After passing Guntakal it follows the Penner valley, and then crosses the Carnatic to Madras.

Now follow the mail route to Calcutta. After passing through Thal Ghat we run down the Deccan slope to the Tapti valley. Then, passing through a gap in the Satpuras, we reach the Narbada valley. The train runs up this valley for 300 miles to Jubbulpore, then over the watershed to the great plain, and so to Allahabad. From this city the train runs over the E.I.R. to Howrah, completing the journey in 36 hours. A second mail route to Calcutta is provided by the G.I.P. and the **Bengal and Nagpur** railway. It runs through the lowlands on the south side of the plateau of Central India.

Madras is connected with Calcutta by lines along the east coast plain. The railways making the connection are the M.S.M. and the Bengal and Nagpur.

The G.I.P. **mail route from Bombay to Delhi** follows the Narbada valley line to Itarsi. Here it turns northward through the Vindhyas. It crosses the watershed near Bhopal, and runs down the Betwa valley into the plain. Then it continues through Jhansi, Agra and Muttra to Delhi, reaching the capital in 30 hours.

The **Bombay, Baroda and Central India** railway serves the districts after which it is named, and makes connections with Cawnpore, Muttra and other towns in the Ganges basin. It also provides another link between Bombay and Delhi. This line follows the coastal plain northward from Bombay. North of Baroda it divides, sending a branch along each side of the Aravalli Hills. One goes through Ahmadabad and up the Luni valley, and past Ajmer and Jaipur; the other goes through Rutlam and down the Chambal valley.

Bengal, Bihar and Orissa and the United Provinces are covered with a network of railways, joining the numerous towns of these provinces. The chief railways are the **Bengal and North Western** and the **Eastern Bengal State** railway—in addition to the E.I.R. mentioned above. The building of these railways has caused a reduction in river traffic through the plain.

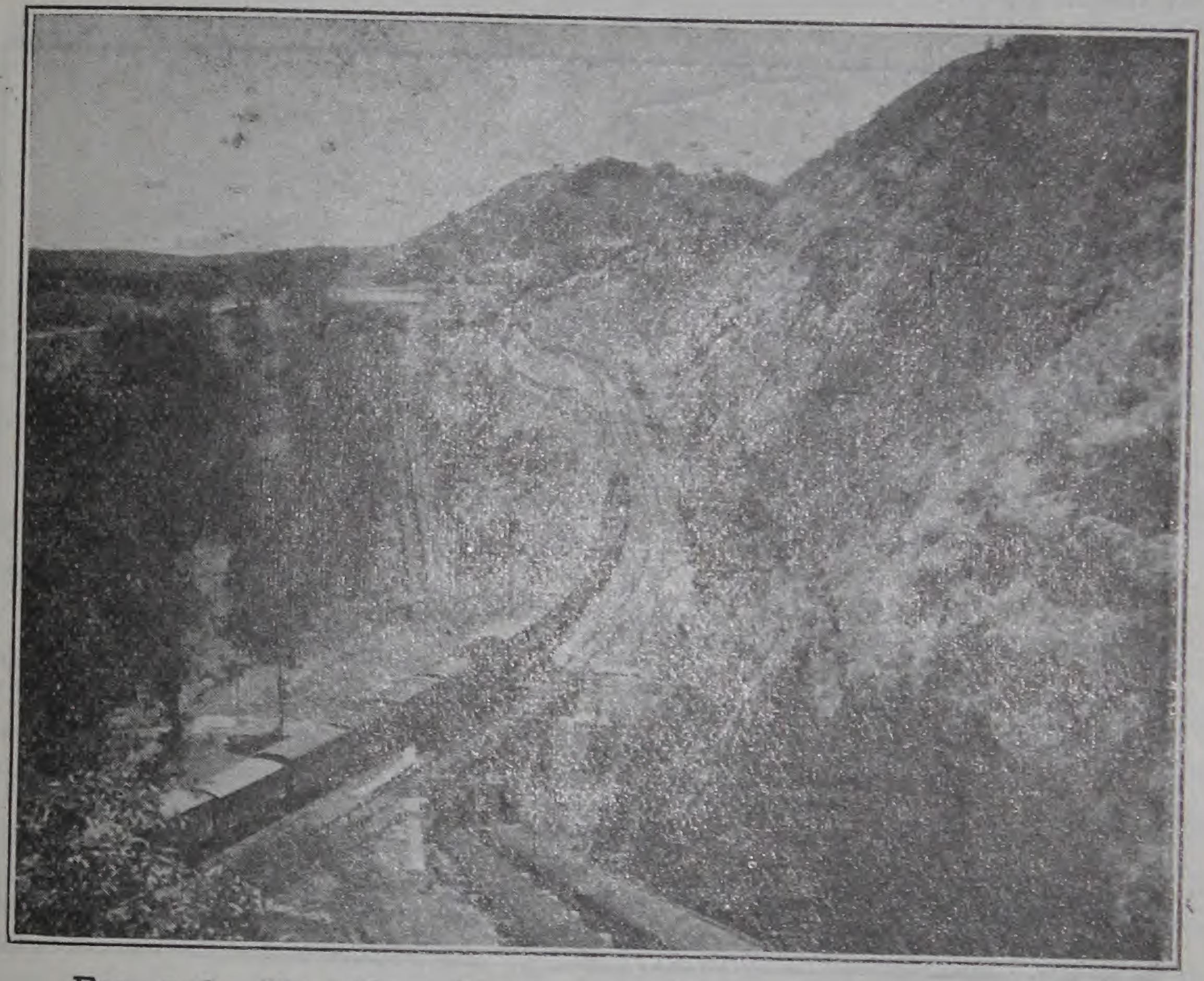


FIG. 196.—THE NEW ALIGNMENT, BHOR GHAT, ON THE BOMBAY-POONA LINE.

The upper part of the valley of Assam is connected with Chittagong by the **Assam-Bengal** railway. A branch line joins the coalfield near Ledo, in the north of Assam, with Dibrugarh. This is a river port on the Brahmaputra, reached by steamboats.

The **South Indian** railway provides means of communication between Madras, Calicut, Trichinopoli, Tuticorin and other towns in the south of the peninsula. Tuticorin has a steamboat service to Colombo.

Airways. These are steadily increasing in number in India. A

large number of the important towns in India are linked by regular local services. These local services are very popular because they enable people to avoid the long dusty train journeys. Karachi is linked to Calcutta and to Colombo (via Bombay) by air routes. India in its turn is joined to the rest of the Empire by the Imperial Airways Service and also shares in the new cheap air letter service of the Empire.

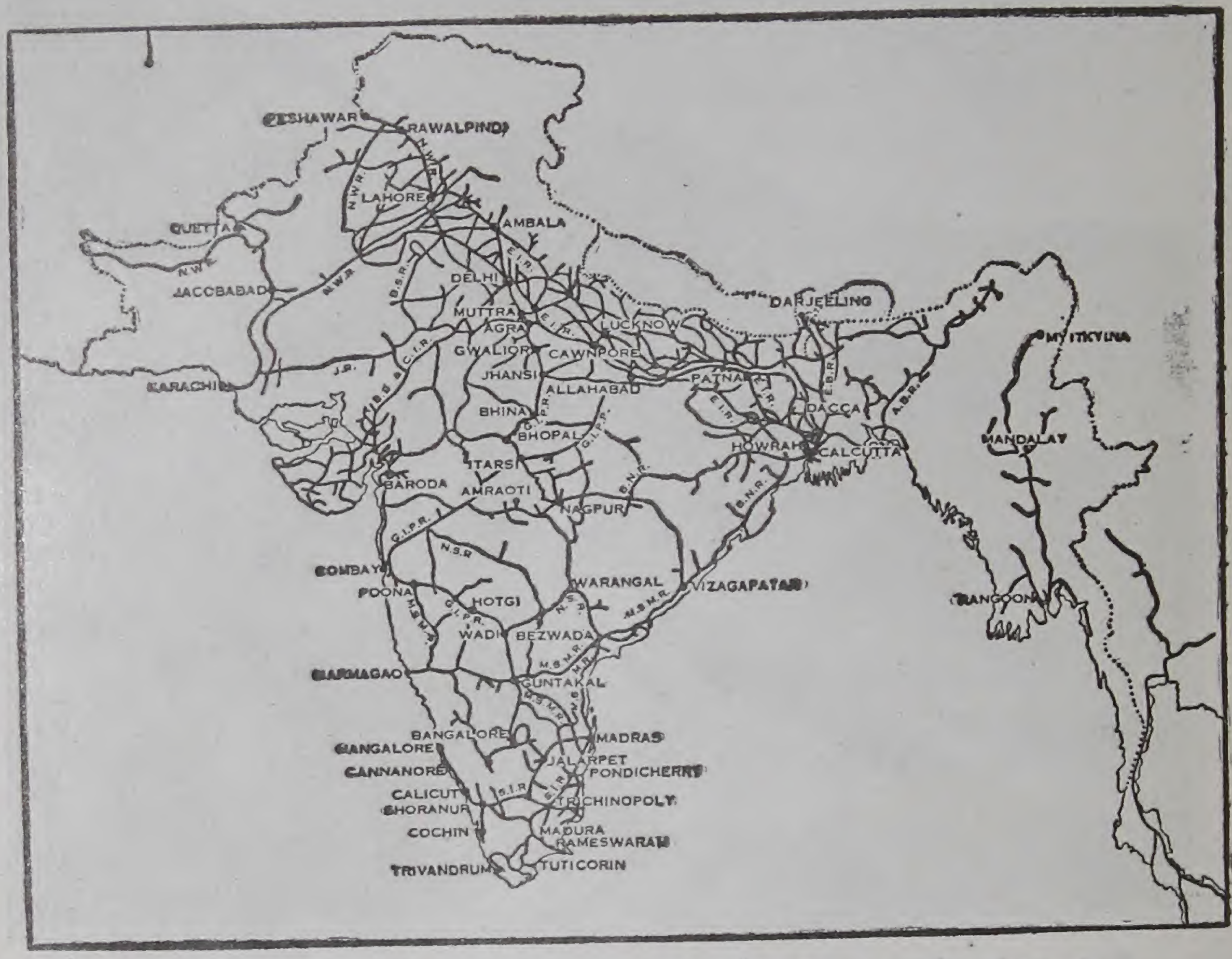


FIG. 197.—THE CHIEF RAILWAYS OF INDIA AND BURMA.

EXERCISES

1. Name the principal buyers of Indian wheat, jute, tea, cotton, oil-seeds, and lac, and the ports from which the commodities are sent.

2. Give a list of manufactured articles exported from India. Name the countries to which they are sent, and say what India receives in return.

3. What is meant by the "hinterland" of a port? What is the hinterland of Calcutta, of Bombay, of Karachi? Illustrate your answer with sketch maps.

4. Name some ports which have declined, giving reasons. Show their situation on sketch maps.

5. Describe the regions you would pass through on a journey from Peshawar to Madras; name the chief towns on the way, and the railways on which you would travel.

6. Draw a sketch map showing the chief routes from Bombay to other cities in India. Name the railways and chief towns on each route, and explain the relation between surface relief and the direction of the railways.

XXXIX. CEYLON

Ceylon lies off the south-east of India, from which it is separated by Palk Strait and the Gulf of Mannar. The rocks of which it is built are similar to those of the Deccan. Far away back in the past Ceylon must have been joined to India. Two small islands, Rameswaram and Mannar, are all that remain of the last link between Ceylon and the mainland. A coral reef called Adam's Bridge lies between these two islands.

Ceylon consists of a **mountain region** surrounded by a **plain**. The highland is somewhat south of the centre of the island. It has been dissected by rivers which flow from it in every direction. The longest river is the Mahaweli Ganga, which reaches the sea near Trincomalee. This stream has cut a deep valley in the highlands, under the shadow of the loftiest peak, Pedrotallagalla (8300 feet). A smaller but better known mountain is Adam's Peak (7350 feet), which is visited by pilgrims every year.

The **coastline** is irregular, but it provides good natural harbours only at Trincomalee and Galle. Colombo has a very good artificial harbour. Its convenience as a calling-place for ships has made it more important than any other place in Ceylon. It is the chief business town and headquarters of the import and export trade of the island.

The **climate** of Ceylon was described in Chapter XXIII. We will briefly note the chief features again. The island lies between 5° and 10° N. The sun is therefore in the zenith twice each year. The climate is tropical, but the sea has an equalising influence. The plain has a mean temperature of about 80° F., but the chief hill-

station, Nuwara Eliya (6200 feet), has a mean temperature of 59° F. In the south-west of Ceylon the rainfall varies from 80 to 100 inches. At Colombo the annual fall of 88 inches includes 32 inches between April and June, and 33 inches between October and December. There are comparatively dry areas in the north, north-west and south-east. These require irrigation and they are thinly peopled. Ruined wells and reservoirs indicate that they must once have had a large population.

FIG. 195.—VIEW OF RICE FIELDS IN CENTRAL HIGHLANDS, CEYLON.

The population of Ceylon consists mainly of Sinhalese (35 lakhs) and Tamils (14 lakhs). There are small numbers of Europeans, Malays and others. The Sinhalese are supposed to be descendants of people who came into the island from India over 2000 years ago. The earlier inhabitants are now represented by a small group of Veddas, the "wild men of Ceylon," whose numbers are diminishing. The western half of the island is more thickly peopled than the eastern half; it is the better food-producing area. Population is most dense in the south-west. Sixty per cent. of the people are

FIG. 199.—A TEA PLANTATION IN CEYLON.

FIG. 200.—A RUBBER PLANTATION IN CEYLON.

Buddhists, and twenty-two per cent. Hindus; the rest are mainly Christians and Muhammadans.

Natural resources. The warm climate and abundant rainfall are very favourable to tree growth. At one time Ceylon must have been almost covered with **forest**. Much land has been cleared, especially in the south-west, for agriculture and plantation work. There are still tracts of forest on both plain and mountains. The chief timbers from the northern forests are ebony and satinwood.

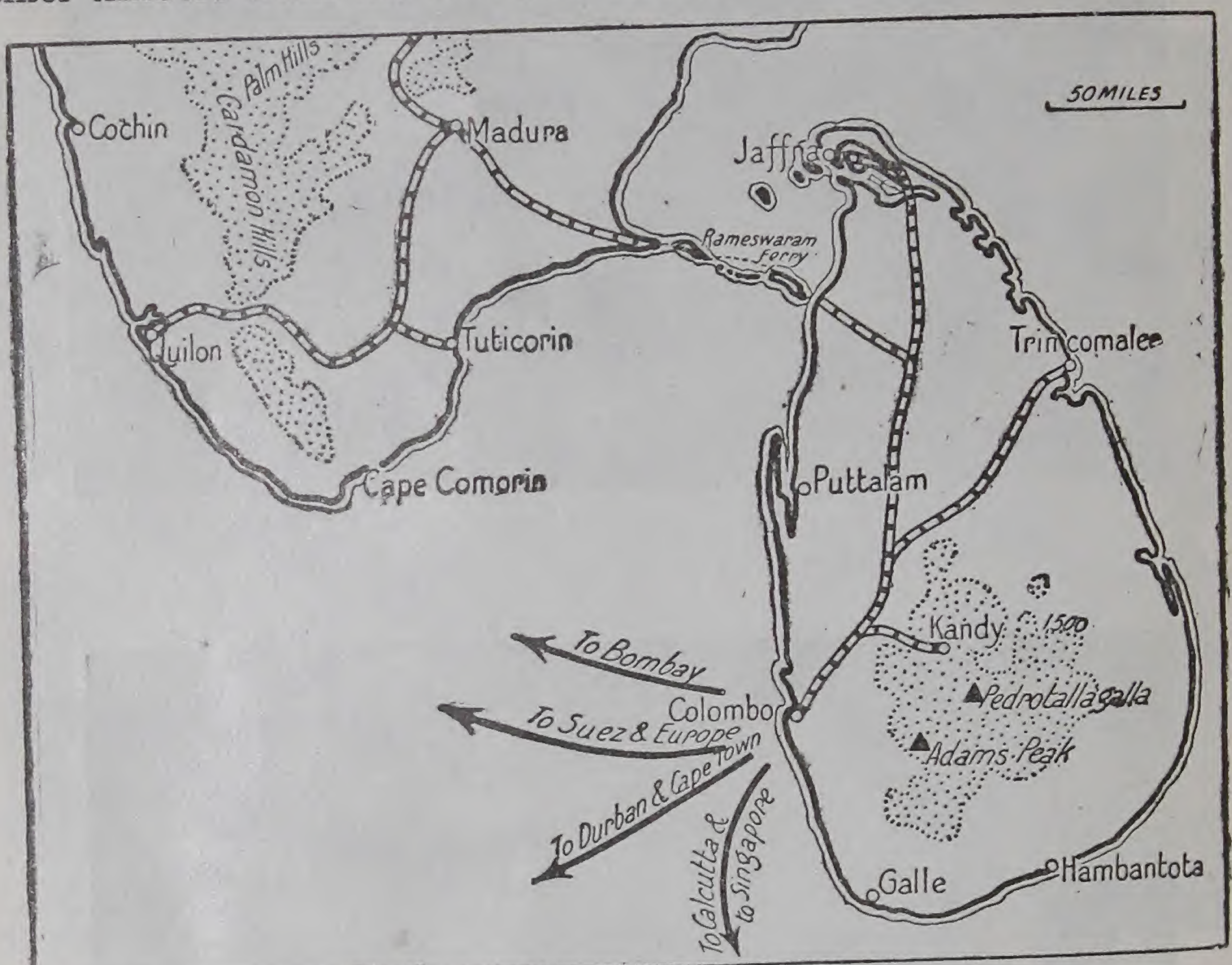


FIG. 201.—CEYLON AND THE SOUTHERN END OF INDIA.
Broken lines show railway routes and chief steamship routes.

The southern forests produce ironwood and other timbers, used largely for making packing-cases for tea and rubber. Certain areas in the interior have been replanted, partly with trees from other countries. These plantations contain teak, mahogany, eucalyptus, jak, cinchona and coniferous trees.

Most of the workers are engaged in **agriculture** and **plantation work**, or in industries connected with these branches of work. The **principal crops** are coconuts, rice, tea, rubber, areca nuts, cinnamon, citronella, cacao, tobacco and cardamoms.

Rice is grown as the staple food. Home supplies are not sufficient for the people. Large quantities are imported from Burma every year. Coconut plantations cover a very extensive area in the west coastal plain, from Puttalam to Hambantota. The tea and rubber plantations have been very successful. Tea plantations are found in the hilly regions, and rubber plantations in the wet south-western plain. Kandy, beautifully situated amongst the hills, is the chief centre of the plantation region of the interior.

Cinnamon and cacao are grown to a limited extent. The amount of land devoted to these is gradually diminishing. Their place is being taken by coconuts and rubber. Areca nuts are widely grown in village gardens, partly for home consumption and partly for export to India and the Maldive Islands. Experiments have been made in growing sisal hemp and cotton. It is likely that the cultivation of these plants will receive more attention in future.

Ceylon does not possess great stores of mineral wealth. The chief mineral is plumbago, which is used in making stove polish, lubricants and lead pencils. The export trade in plumbago has declined considerably. Precious stones, such as sapphire, ruby, amethyst, cat's-eye, garnet and others are found in the south-west. Ceylon possesses one of the important pearl fisheries of the world. The pearl banks in the Gulf of Mannar have been fished for perhaps 3000 years. The yield varies greatly.

The **Maldive Islands** which lie about 500 miles south-west of Ceylon, and the Laccadives due north of them, are coral atolls standing on a submarine extension of India. The chief products are coconuts, grain and fruit. Fresh water is scarce, but the people collect rain-water as it runs down stems of trees. Seafaring is an important occupation.

EXERCISES

1. Write an account of the surface relief and coast of Ceylon. Illustrate with a sketch map, shading the high land.

2. Draw an outline of Ceylon, colour green and yellow respectively the areas devoted to production of coconuts and tea. Write notes on the uses of the coconut palm.

3. Write out a list of the agricultural and plantation products of Ceylon, and the chief timbers the island produces.

XL. BURMA

This country was a province of India but was separated from it by the Government of India Act of 1935. Burma lies to the east of India and consists for the most part of a series of beautiful valleys which are divided from each other by mountains and hills.

The broad rain-drenched coastal plain of Burma is separated from the Irrawaddy valley by the Arakan Yoma, which runs parallel to the Burmese coast-line and ends at Cape Negrais, but there is a submarine extension southwards from which rise the Andaman and Nicobar islands. East of the Arakan Yoma lies the valley of the Irrawaddy, then comes a lower ridge, the Pegu Yoma, separating the valley of the lower Irrawaddy from that of the Sittang. Following the Pegu Yoma northwards we find an extinct volcano, Popa, nearly 5000 feet high. Further north still, on the Chidwin valley, are many more extinct volcanoes.

East of the valleys of the Sittang and upper Irrawaddy there is a broad dissected high land—the plateau of the Shan Hills. The Salween, Mekong and many other rivers have cut long, deep, narrow valleys in the plateau. Some of the rivers have made underground channels in limestone areas. They disappear suddenly, flow underground and reappear lower down.

The rivers of Burma, running from north to south through the country, supply natural routes in that direction. The Irrawaddy river, which is navigable as far as Bhamo, 900 miles from the sea, is the most important highway. Its tributary, the Chidwin, forms another route to the forested mountains of the north. Further east the valleys of the Sittang and Salween also lead into northern Burma.

The climate of Burma was described in Chapter XXXIII but the chief features may be summarized here. The country stretches from 29° N. to 16° N. and has therefore a hot climate. The mean temperature of the year is about 79° in Lower Burma and 75° to 81° at stations in the plains of Upper Burma.

Burma receives the bulk of its rain from the south-west monsoons in the months from June to September. The Tenasserim and Arakan coasts receive most rain, having an average of 175 inches a year, and the air of these coastal districts is damp throughout the

year. Further inland the rain decreases to an average of 40 to 50 inches in the year, but in the extreme north of Upper Burma in the districts of Chidwin, Bhamo and Myitkyina there is an annual rainfall of 73 inches.

The forests of the country are very extensive and form an important part of the natural wealth of the country. The trees of most economic value are the teak, the sal and the cutch. These forest lands are the home of wild elephants which, when caught and tamed, are a great help with the timber industry. There are large tracts of dense grassland on the Arakan and the other ranges, which are the home of the one-horned rhinoceros which is now becoming very rare. Other animals found in Burma are the monkey, the wild buffalo, the barking deer and the Indian wild boar.

The 1931 census report gives the total population of Burma as over 14 millions. The Burmese resemble the Chinese in appearance and the great majority of them are Buddhists by religion. Most of the population is concentrated in the valleys of the Irrawaddy and Sittang as these are the most fertile parts of the country. The western uplands, the Chin hills, are forested and thinly populated by semi-savage tribes, but the hilly region between the Salween and the Irrawaddy is well cultivated and supports a large Shan population.

OCCUPATIONS

Lumbering. The forests supply large quantities of timber and Burma exports great quantities of teak from the ports of Rangoon and Moulmein. The former town has some mills and a match-making factory which have grown up in connection with the lumber trade.

Agriculture. Rice is grown on the coastal plain, the river valleys and their deltas. The Burmese grow rice considerably in excess of their needs and export large quantities of it. Other food plants and tobacco are grown and cigars are manufactured in the country.

Mining. Lead is found in the Shan States and tin and wolfram occur in Southern Burma. The ruby mines of Mogok are famous and jadeite is also found in Upper Burma.

Pegu Yoma. One follows the Sittang valley to Mandalay, the other runs to Prome on the Irrawaddy, throwing off a branch through the delta to Bassein. In Upper Burma a line runs from Sagaing on the Irrawaddy up the valley of the Mil and then through the hills to Myitkyina which is about 100 miles further up the Irrawaddy than Bhamo. There is a branch line from Mandalay to Lashio in the northern Shan States.

Air services are being rapidly developed in Burma.

EXERCISES

1. Draw a sketch map of Burma, marking in the principal highland regions and the courses of the river valley

2. Draw an outline map of Burma and mark in the regions that produce rice, tobacco, timber and petroleum.

3. Draw a sketch map of the Burmese railway system.

The working of petroleum in the upper valley of the Irrawaddy supplies a large number of people with work. Crude oil from the oil fields at Yenangyaung is brought 300 miles by pipe line to Syriam, just outside Rangoon, where it is refined. Burma supplies about two-thirds of the petrol, kerosene oil and fuel oil used in India.

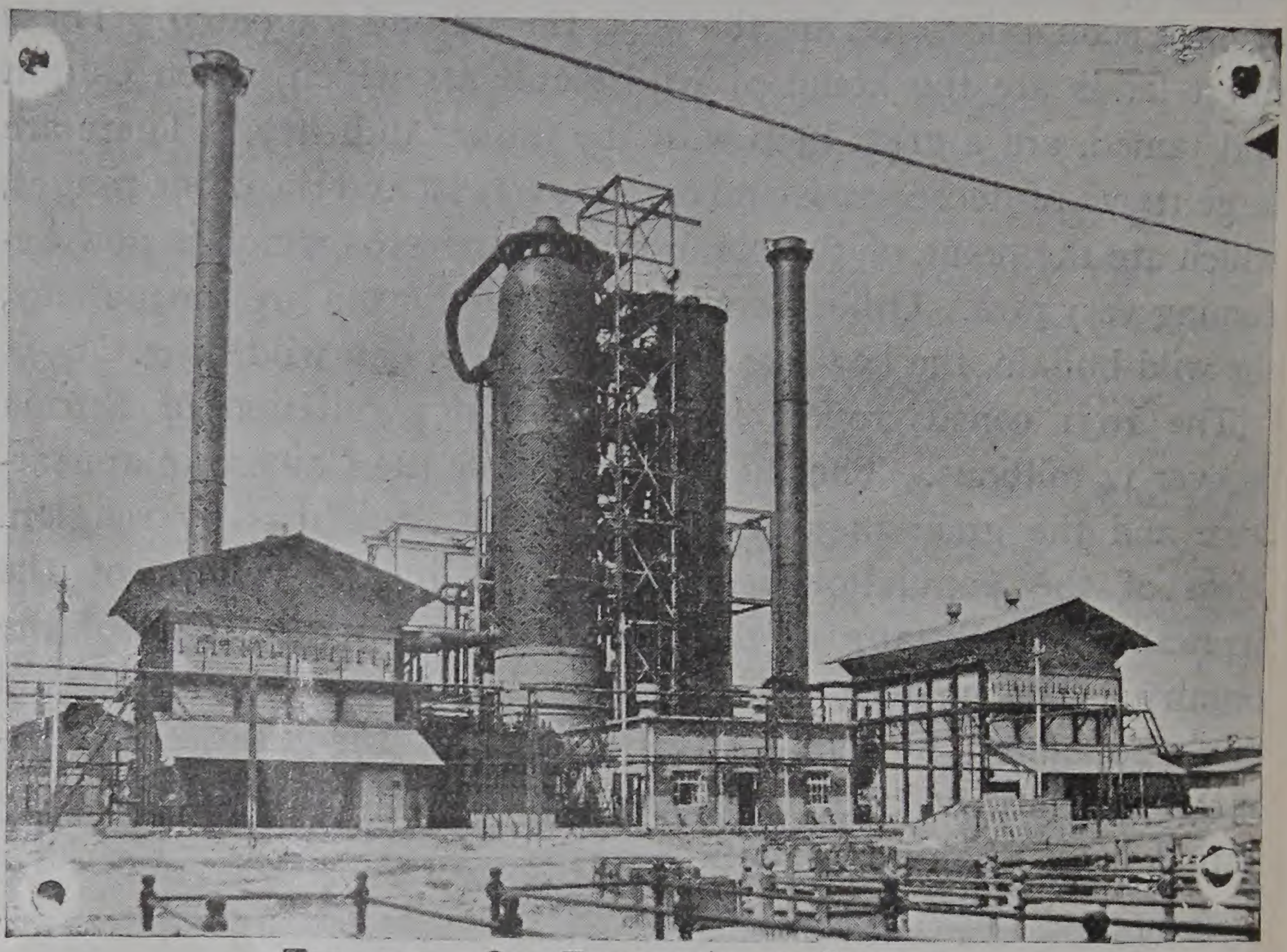


FIG. 202.—OIL REFINERY AT SYRIAM.

A large number of the Burmese people wear silk clothes, and raw silk, which is obtained from the upper valley of the Irrawaddy, is woven by the women into materials. In Burma almost every mother weaves material for her household on a primitive loom. Wood-carving, metal-work and embroidery are other industries.

Rangoon, situated on one of the tributaries of the Irrawaddy, is the capital and the chief port of the country. Bassein, Martaban and Moulmein are other ports. Mandalay is the most important town of the Irrawaddy plain and a Buddhist centre.

Bhamo, on the upper Irrawaddy, is the terminus of the caravan routes from China.

Communications. The rivers are the natural highways of the country and in most cases the railway lines run along the river valleys. In Lower Burma there is a railway on either side of the

XL. BRITISH EMPIRE SUMMARY

(Exports of the larger Dominions, etc., will be found in Section II of the book.)

Dominion, Colony or Protectorate.	*Capital or Chief Town.*	*Exports.*
Europe.		
Channel Islands.	St. Helier (Jersey).	Fruit, vegetables, dairy cattle.
	St. Pierre (Guernsey).	
Gibraltar.		[Port of call.]
Malta.	Valetta.	Fruit, vegetables.
Africa.		
Union of South Africa.		
Cape of Good Hope.	Cape Town.	
Orange Free State.	Bloemfontein.	
Transvaal.	Pretoria.	
Natal.	Pietermaritzburg.	
Southern Rhodesia.	Salisbury.	Grain, wool, cattle.
Basutoland.	Maseru.	[A pastoral country.]
Bechuanaland.	Mafeking.	
Swaziland.	Mbabane.	
South West Africa.	Windhuk.	
Northern Rhodesia.	Livingstone.	
Nyasaland.	Blantyre.	Cotton, tobacco, rubber.
Zanzibar.	Zanzibar.	Cloves, copra, ivory.
Kenya Colony.	Nairobi.	Cotton, hides, oil seeds.
Uganda.	Mengo (native cap.).	Cotton, coffee, rubber.
	Entebbe (Brit. H.Q.).	
Tanganyika Territory.	Dar-es-Salâm.	Sisal, cotton, hides, copra.
Somaliland.	Berbera.	Skins, cattle, gums.
The Sudan.	Khartum.	Gum arabic, cotton.
Gambia.	Bathurst.	Ground-nuts, hides, calabashes.
Sierra Leone.	Freetown.	Palm-oil, kernels, kola nuts.
Gold Coast, Ashanti, and Northern Territories.	Accra.	Cocoa, gold. kola nuts, palm-oil, rubber, timber.
Nigeria.	Lagos.	Palm-oil, tin, hides, cotton, cocoa, mahogany, rubber.
Cameroons.	Buea.	Rubber, palm-oil, cocoa, ivory.
Mauritius (island).	Port Louis.	Sugar, rum, spices, fibre.

Dominion, Colony or Protectorate,	*Capital or Chief Town.*	*Exports.*
Seychelles (islands).	Victoria.	Copra, guano, vanilla.
Ascension.		
St. Helena.	Jamestown.	Flax, fibre.
Asia.		
India.	Delhi.	
Burma.	Rangoon.	
Ceylon.	Colombo.	
Palestine and Haifa.	Jerusalem.	
Malaya.		
1. Federated States.		Tin, rubber, coconuts, rice.
2. Non-federated States.		Rubber.
3. Straits Settlements.	Singapore.	Tin, gum, spices, sago, rubber, pineapples.
Borneo.		
1. Brunei.	Brunei.	Coal, rubber, sago.
2. Sarawak.	Kuching.	Rubber, pepper.
3. North Borneo.	Sandakan.	Tobacco, timber, rubber.
Hong-Kong and Kowloon.	Victoria.	Chinese products.
Wei-Hai-Wei.		[Port of call and health resort.]
Cyprus.	Nicosia.	Fruit, wine, silk, cotton.
Aden (with Perim, Socotra, and Kuria Muria Is.).		[Coaling-station, and trade emporium for African and Arabian goods.]
Bahrein Islands (Persian Gulf).	Manama.	Pearls, coffee, dates.
Australia and the South Seas.		
Australia.	Canberra (Commonwealth capital.)	
New South Wales.	Sydney.	
Queensland.	Brisbane.	
South Australia.	Adelaide.	
Tasmania.	Hobart.	
Victoria.	Melbourne.	
Western Australia.	Perth.	
Northern Territories.	Darwin.	
Papua with Bismarck Is., New Britain, New Ireland, Solomon Is.).	Port Moresby.	Gold, rubber, pearls, copra.
New Zealand (with many groups of small islands: Chatham, Campbell, Antipodes, Bounty, Auckland, Kermadec, Cook, and Samoan).	Wellington.	
Pacific Islands (Tonga, Ellice, and Gilbert, Ocean, Fanning, New Hebrides, etc.).		Copra, fruits.
Fiji Islands.	Suva (or Viti Levu).	Sugar, copra, fruit, rubber.

Dominion, Colony or Protectorate.	*Capital or Chief Town.*	***Exports.***
North America.		
Canada.	Ottawa (Dominion capital.)	
Nova Scotia.	Halifax.	
Prince Edward Island.	Charlottetown.	
New Brunswick.	Fredericktor.	
Quebec.	Quebec.	
Ontario.	Toronto.	
Manitoba.	Winnipeg.	
Saskatchewan.	Regina.	
Alberta.	Edmonton.	
British Columbia.	Victoria.	
Yukon.	Dawson.	
N.W. Territories.	[Ottawa.]	
Newfoundland and Labrador.	St. John's.	
Bermuda.	Hamilton.	
West Indies.		
Jamaica (with Cayman Is. and Caicos Is.).	Kingston.	Fruit, sugar, coffee, rum.
Bahamas.	Nassau.	Sponge, sisal fibre, pine-apples.
Barbados.	Bridgetown.	Sugar, cotton, ginger.
Leeward Is.	St. John (Antigua).	Cotton, limes, fruit.
Windward Is.	St. George's (Grenada).	Cocoa, spices, cotton, arrowroot.
Central and South America.		
British Honduras.	Belize.	Timber, dye-woods, sponge, tortoise-shell.
British Guiana.	Georgetown.	Aluminium ore, gold, sugar.
Trinidad and Tobago.	Port of Spain.	Sugar, cacao, fruit, copra, asphalt, spices.
Falkland Is.	Stanley (pop. 950).	Wool, whale products.
Tristan da Cunha.		[Inhabitants have been offered land in Cape Colony, but they refuse to leave the island, though life there is hard.]
Gough Island.		[South-east of Tristan da Cunha, has valuable guano deposits; no permanent population.]

MISCELLANEOUS EXAMINATION QUESTIONS.

Section I.

1. Explain clearly how the seasons are caused.

2. Distinguish between :

(*a*) Latitude and parallel of latitude.
(*b*) N.N.E. and E.N.E.
(*c*) River-basin and water-parting.
(*d*) Spring tide and neap tide.

3. What are the monsoons ? Explain how they are formed in the different parts of the year.

4. Discuss the elements which regulate the climate of any place. Illustrate your answer with examples.

5. The average monthly rainfall of four places from January to December is given in inches as follows :

I. -	6·3	5·9	4·3	3·0	2·1	0·9	0·2	0·9	3·5	6·3	8·5	9·7
II. -	10·2	9·8	12·2	6·5	10	7·4	5·6	4·6	8·7	7·2	8·4	11·5
III. -	0·4	0·7	0·6	0·6	1·3	1·2	0·9	0·9	0·7	0·7	0·5	0·6
IV. -	0·4	1·1	2·6	5·4	9·4	12·9	12·7	12·4	9·3	4·9	0·9	0·2

Convert these figures into a diagram, point out the striking features, and suggest the localities, giving your reasons in each case.

6. Explain the principal methods of representing the relief of a country on maps.

Draw a contour map of an imaginary island. Let the highest point, 1,500 feet, be somewhere near the centre. Show a steep slope to the west and a gentle slope to the east.

7. What is a volcano ? Discuss the distribution of volcanoes on the earth.

Why does heavy rain often accompany a volcanic eruption ?

8. Describe and explain the course of the winds of the Indian Ocean in July and January.

9. Give an account of the three great races of the world, indicating their distinguishing characteristics and the regions now occupied by the races. How far are the people of India representative of these races ?

10. Explain fully the experimental proof of the rotation of the earth, by means of Foucault's pendulum.

11. " The cause of the seasons is the revolution of the earth round the sun." State why this statement is defective, and explain the causes of the seasons.

12. What is meant by the latitude of a place? Give an account of a simple way of finding the latitude of your college or school.

At a certain place, the sun, on December 21, attained its maximum altitude, 14°, at 11.55 a.m., Greenwich time. Find the latitude and longitude of the place.

13. Describe the conditions of climate and soil favourable to the growth of wheat. Name the principal wheat-growing countries of the world.

14. When it is 6 p.m. at Greenwich, what is the time at the following places: (i) a town of Longitude 80° W.; (ii) the city of Poona.

15. How can the circumference of the earth be determined by observation of the sun?

16. What is the Mediterranean type of climate? Name the parts of the world which have this type of climate. What peculiar plants and agricultural products are to be found in these parts?

17. What is the *Gulf Stream*? How is it caused? Which countries are affected by it and in what way?

18. Draw a diagram showing the wind systems of the world and explain how they are caused.

Section 11.

19. Give an account of the Malay Archipelago, and name the parts of it which are owned by the Dutch.

20. State in what respects Australia differs from the other continents.

21. Draw a sketch map of South America, inserting the chief mountain ranges and rivers.

22. Give a short account of the principal rivers and lakes of North America.

23. Enumerate the British possessions in the different parts of the world.

24. Write short notes on:

(*a*) the Czecho-Slovak State;
(*b*) the Carpathian mountains;
(*c*) the physical features of Switzerland;
(*d*) the river system of Germany.

25. Write notes on: Adelaide, Cherrapunji, Chicago, Constanti-

nople, Durban, Elephanta Island, Pekin, Tokyo, Warsaw, and Washington.

26. Write notes on ... *four* of the following: Great Lakes of Western Asia; gold mines of India; Typhoon; Mulattoes; Gulf Stream; Eucalyptus.

27. Show, by a sketch map if possible, the centres and towns where any *four* of the principal industries of England are located.

28. How have natural barriers influenced the distribution of peoples and the creation of states (*a*) in Europe, (*b*) in Asia?

29. Mention the divisions of South America, the races inhabiting them, and the principal productions.

30. Describe the physical features and the vegetation in Australasia.

31. Name the chief exports of the following places: Mexico, Straits Settlement, Congo Basin, Cuba, Hawaiian Islands, Trinidad, Sweden, New Zealand.

32. Explain how geographical conditions affect the life and occupations of any *three* of the following peoples:

(i) The Afghans; (ii) The Arabs; (iii) The Norwegians; (iv) The Danes; (v) The Japanese.

33. Describe a journey from Bombay to London, mentioning the chief places through which you would pass and what things of interest you would see at each of these places.

34. Give reasons for the following:

(i) Berar produces cotton;
(ii) New Zealand exports meat;
(iii) Switzerland manufactures watches and other small goods;
(iv) The Amazon basin is thinly populated;
(v) Sheffield manufactures cutlery.

35. Describe the position of any *five* of the following towns, and explain how their position has affected their growth:

(1) Rio de Janeiro; (2) San Francisco; (3) Sydney; (4) Liverpool; (5) Chicago; (6) Colombo; (7) Basra; (8) Delhi.

SECTION III.

36. Draw a map of the Indian Empire showing the courses of the East Indian Railway and the Bengal Nagpur Railway. Insert the University towns of India in this map.

37. Name:

(*a*) the rivers of the Deccan that flow into the Bay of Bengal;
(*b*) the parts of India where tea is cultivated;
(*c*) the principal hill ranges of Burma;
(*d*) the important lakes of India.

38. Enumerate the different Provinces and the chief Protected States in India, with the name of the seat of the Government in each case.

39. Write a description of Bengal enumerating (*a*) the boundaries of the Province, (*b*) the chief rivers, (*c*) the important seats of industry, (*d*) the possessions of any European power other than the British, and (*e*) climate.

40. Draw a map showing the basin *either* of the Ganges, *or* of the Cauvery river; mark the positions of the chief towns, and show the hills and the railways.

41. In what parts of India are the following grown: tea, sugar-cane, cotton, tobacco? Write what you know of the industries arising from these products.

42. Compare the mountain system of Greece with that of India. What are the advantages and disadvantages in each case?

43. Contrast the towns of Rangoon and Karachi with regard to the conditions which favour the commercial and industrial importance of each. Discuss the possibilities of their future development.

44. Draw a map of India and Burma, and show on it the following:

(*a*) the principal ports;
(*b*) the chief hill stations;
(*c*) the areas producing rice, tea and coal.

45. The average temperatures for the months of June and January for Bombay, Simla, and Lahore are given below:

Town.	Mean Temperature, June.	Mean Temperature, January.
A	93° F.	54° F.
B	82° F.	72° F.
C	67° F.	39° F.

State which of these three towns the letters *A*, *B* and *C* represent. Give reasons for your answer.

46. Describe the important railway route from your examination centre to Calcutta, mentioning the chief towns on the route and the main agricultural and mineral products of the regions through which the route passes.

47. The following statements can be made true by filling in the blanks with *one* of the words or figures given in brackets at the end

of each sentence. Rewrite the statements with the blanks correctly filled in :

(i) There are . . . . mines in Burma. (Copper, tin, gold.)

(ii) There are rock-salt mines in . . . . . (Bengal, The Punjab Mysore.)

(iii) Colombo is . . . . miles from Aden. (2100, 610, 7600.)

(iv) Allahabad is to the . . . . of Benares. (East, North, West.)

(v) . . . . is the seat of Government of the United Provinces (Cawnpore, Allahabad, Lucknow.)

(vi) Zanzibar exports . . . . . (Sugar, cloves, coffee.)

(vii) The latitude of Berlin is . . . . . (52° N., 12° N., 22° S.)

(viii) . . . . Chile produces saltpetre. (Central, Southern, North.)

(ix) The Kalahari is a . . . . . (Forest, desert, mountain.)

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